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OL. VI, No. 6

JUNE 15, 1908

INDIANA UNIVERSITY BULLETIN



GRADUATE SCHOOL 1908

ered as second-class matter May 16, 1908, at the postoffice at Bloomington, Indiana, under act of Congress of July 16, 1894 "The highest function of the real university is that of instruction by investigation. The essential quality of the university is the presence in its Faculty of men qualified to do university work. It matters not how many or how few the subjects taught, or what may be the material equipment of the teacher, the school in which study and investigation go hand in hand is in its degree a university."—David Starr Jordan.

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VOL. VI

BLOOMINGTON, IND., JUNE 15, 1908

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Entered as second-class matter May 16, 1908, at the postoffice at Bloomington, Indiana, under Act of July 16, 1894. Published from the University office, Bloomington, Indiana, semi-monthly April, May, and June, and monthly January, February, March, July, September, and November.

The Graduate School

In this number of the Bulletin are presented details relating to the Graduate School of Indiana University—its purpose and administration, equipment of the University for graduate work, requirements for advanced degrees, scholarships and teaching fellowships available, and announcements of courses for 1908-09 in the several departments comprising the school. Undergraduate courses are here listed only briefly. For details concerning these, and for other information concerning the University not here given, address

THE REGISTRAR, INDIANA UNIVERSITY,
Bloomington, Indiana.

University Calendar, 1908-09

FALL TERM.

Sept. 22, Tuesday.

Registration and enrollment in classes

Sept. 23, Wednesday.

for the Fall term. Recitations and lectures begin.

Nov. 26 and 27, Thursday and Friday.

Thanksgiving recess.

Dec 22, Tuesday, 6 p. m.

Fall term ends.

WINTER TERM.

Jan. 5, Tuesday.

Registration and enrollment in classes for the Winter term.

Jan. 6, Wednesday, Jan. 20, Wednesday. Recitations and lectures begin. Foundation day, a holiday.

Mar. 26, Friday,

6 p. m. Winter term ends.

SPRING TERM.

April 6, Tuesday.

Registration and enrollment in classes for the Spring term. Recitations and lectures begin.

April 7, Wednesday.

Spring term ends.

June 18, Friday, 6 p. m. June 23, Wednesday, 10 a. m.

University Commencement.

Faculty and Officers

COUNCIL OF THE GRADUATE SCHOOL

CARL H. EIGENMANN, Ph.D., Professor of Zoölogy, Dean.

Harold Whetstone Johnston, Ph.D., L.H.D., Professor of Latin.

ARTHUR LEE FOLEY, Ph.D., Professor of Physics.

ULYSSES GRANT WEATHERLY, Ph.D., Professor of Economics and Social Science.

ERNEST HIRAM LINDLEY, Ph.D., Professor of Philosophy and Psychology.

John Andrew Bergström, Ph.D., Professor of Education.

FACULTY OF THE GRADUATE SCHOOL

WILLIAM LOWE BRYAN, Ph.D., LL.D., President of the University.

HORACE ADDISON HOFFMAN, A.M., Professor of Greek.

James Albert Woodburn, Ph.D., Professor of American History and Politics.

ROBERT JUDSON ALEY, Ph.D., Professor of Mathematics.

CARL H. EIGENMANN, Ph.D., Professor of Zoölogy, and Director of the Biological Station.

HAROLD WHETSTONE JOHNSTON, Ph.D., L.H.D., Professor of Latin. ROBERT EDWARD LYONS, Ph.D., Professor of Chemistry.

ARTHUR LEE FOLEY, Ph.D., Professor of Physics.

DAVID MYERS MOTTIER, Ph.D., Professor of Botany.

ALBERT FREDERICK KUERSTEINER, Ph.D., Professor of Romance Languages.

ULYSSES GRANT WEATHERLY, Ph.D., Professor of Economics and Social Science.

ERNEST HIRAM LINDLEY, Ph.D., Professor of Philosophy and Psychology.

John Andrew Bergström, Ph.D., Professor of Education, and Director of the Psychological Laboratory.

BURTON DORR MYERS, M.D., Professor of Anatomy.

Samuel Bannister Harding, Ph.D., Professor of European History.

Amos Shartle Hershey, Ph.D., Professor of Political Science and International Law.

BERT JOHN Vos, Ph.D., Professor of German.

WILLIAM A RAWLES, Ph.D., Professor of Political Economy.

CARL WILHELM FERDINAND OSTHAUS, A.M., Professor of German.

SCHUYLER COLFAX DAVISSON, Sc.D., Professor of Mathematics.

DAVID ANDREW ROTHROCK, Ph.D., Professor of Mathematics.

WILLIAM J MOENKHAUS, Ph.D., Professor of Physiology.

Louis Sherman Davis, Ph.D., Professor of Chemistry.

ALFRED MANSFIELD BROOKS, A.M., Professor of Fine Arts.

WARNER FITE, Ph.D., Professor of Philosophy.

WILL DAVID HOWE, Ph.D., Professor of English.

AUGUSTUS GROTE POHLMAN, M.D., Professor of Anatomy.

HENRY RIHL ALBURGER, M.D., Professor of Pathology.

George Davis Morris, A.M., Associate Professor of French.

ERNEST OTTO HOLLAND, A.B., Professor of Education.

FRANK WILLIAM TILDEN, A.M., Associate Professor of Greek.

Guido Hermann Stempel, A.M., Associate Professor of Comparative Philology.

ROLLA ROY RAMSEY, Ph.D., Associate Professor of Physics.

Edgar Roscoe Cumings, Ph.D., Associate Professor of Geology.

OLIVER W BROWN, A.M., Associate Professor of Chemistry.

CHARLES ZELENY, Ph.D., Associate-Professor of Zoölogy.

Frank Marion Andrews, Ph.D., Associate Professor of Botany.

LILLIAN GAY BERRY, A.B., Associate Professor of Latin.

HENRY THEW STEPHENSON, B.S., A.B., Associate Professor of English.

Frank Aydelotte, A.M., B.Lit., Associate Professor of Euglish.

WILBUR ADELMAN COGSHALL, A.M., Associate Professor of Astronomy.

EDWARD PAYSON MORTON, A.M., Assistant Professor of English.

EUGENE LESER, Ph.D., Assistant Professor of German.

ULYSSES SHERMAN HANNA, Ph.D., Assistant Professor of Mathematics.

Joshua William Beede, Ph.D., Assistant Professor of Geology.

JAMES M VAN HOOK, A.M., Assistant Professor of Botany.

Frank Curry Mathers, Ph.D., Assistant Professor in Chemistry

THOMAS LEGRAND HARRIS, A.M., Instructor in History.

VERNON ANDREW SUYDAM, B.S., Instructor in Mechanics.

Charles Haseman, Ph.D., Instructor in Mathematics.

The Graduate School

I. ITS HISTORY

The Indiana University, situated at Bloomington, Indiana, is the State University of Indiana and the head of the public school system of the State. It takes its origin from the State Seminary, which was established by act of the Legislature, approved January 20, 1820. In 1828 the title of the Seminary was changed by the Legislature to that of the Indiana College; and in 1838 the University was given its present name and style. In 1867 Indiana University became coeducational; and in 1886-87, under the leadership of President David Starr Jordan, there was a reorganization of the curriculum on the major subject and departmental basis.

It consists at present of

The College of Liberal Arts, organized in 1824.

The Law School, organized in 1842, reorganized in 1889.

The School of Medicine, organized in 1903.

The Graduate School, organized in 1904.

Graduate work began and the first advanced degrees were offered in the early eighties, but a formal organization and segregation of the Graduate School was not effected till 1904.

An outline of the scholarly work of the University to the time of the organization of the Graduate School will be found on pages 197-348 of the volume entitled 'Indiana University, 1820-1904'. About 4,000 titles of books and articles by members of the University are there listed.

II. PURPOSE AND ADMINISTRATION

The Graduate School furnishes opportunities for advanced work leading to careers in higher education and in certain lines of investigation. It does not offer work leading to professional degrees in Law or in Medicine.

The work of the School is a direct continuation of that of the College of Liberal Arts, and as such is the most advanced work in education undertaken by the State. The Graduate School stands, therefore, at the head of the University, and is the culmination of the public school system of the State.

The school is administered by the Council of the Graduate School. It is composed of members of the Faculty representing different fields of learning.

Not all Departments of the University are at present equally equipped for extended graduate work. In recognition of this fact, the amount and nature of the graduate work offered by the different Departments varies. Some Departments offer work for the A.M. degree only, while others offer work leading to the degree Ph.D.

III. ADMISSION

Students holding the degree A.B. from this institution, or the same degree or its equivalent from similar educational institutions, are admitted to the Graduate School on presentation of the proper credentials. The requirements for the A.B. degree in Indiana University are the completion of the following courses:

- 1. Two hours a week for three terms in English Composition. 6 hours
- 2. Five hours a week for six terms in ancient or modern (foreign) languages. 30 hours

3. Five hours a week for three terms in college Mathematics (usually Algebra, Trigonometry, and Analytical Geometry), or one year's work in Physics.

15 hours

- 4. Five hours a week for three terms in some science other than Physics.

 15 hours
- 5. Five hours a week for four and four-fifths terms, chosen from the Departments of History and Political Science. Economics and Social Science, English, Philosophy, Education, and Fine Arts.
- 6. A major subject consisting usually of nine terms' work, five hours a week, in one of the Departments of Liberal Arts.

 45 hours
- 7 Collateral work, designated by the head of the Department of the major subject, consisting usually of six terms' work, five hours a week.

 30 hours
 - 8. A brief course in hygiene. 3 hours
- 9. Elective work sufficient to make a total for the full course of twelve terms.

 12 hours

Total, 180 hours

The unit of University credit is the "hour". An "hour" is one recitation or laboratory period per week carried during one term. The regular college year is divided into three terms. A Summer term of about equal length is provided in which some of the courses given during the regular year are repeated.

Ordinarily a student will carry 15 hours per term and complete an undergraduate course in four years.

All graduates will enroll at the beginning of each term, and those entering regularly organized classes will submit to the same regulations as undergraduate students. Work will in many cases be individual and not controlled by a recitation schedule.

IV. FEES

Tuition in the University is free. A contingent fee of five dollars a term is charged all students. It covers in part the cost of the physical maintenance of the University, and is not applied to the cost of tuition, which is provided wholly by the State.

The Library fee is one dollar a term.

The Laboratory fees are one dollar per credit hour in all courses.

The Gymnasium fee, if the work in physical training is taken, is one dollar a term.

An Examination fee of one dollar is charged for each make-up or special examination. This fee is paid to the Bursar, and his receipt when presented to the proper instructor constitutes his authorization for holding the examination.

The fee for any Degree is five dollars, and must be paid to the Treasurer of the University at least thirty days before the granting of the degree, and a receipt for it filed with the Registrar.

V. EQUIPMENT OF THE UNIVERSITY

Buildings. The campus of the University adjoins the town, and contains about seventy acres of elevated ground, partly covered with a heavy growth of maple and beech.

The University offices are in Maxwell Hall, a fireproof building of white limestone, erected in 1890, which, with an extension recently completed, also houses the School of Law.

Owen Hall, a brick building erected in 1884, contains the museum, and the lecture rooms and laboratories of the Departments of Zoölogy and Botany. Wylic Hall, also of brick, erected in 1884, contains the laboratories and lecture rooms of the Departments of Chemistry and Pathology, and the rooms of the Department of Mathematics.

Kirkwood Hall, of white limestone, built in 1895, contains the rooms of the Departments of English, History, Economics, Greek, Latin, Romance Languages, and German.

Mitchell Hall is a frame building formerly used for the Women's Gymnasium.

Kirkwood Observatory, completed in 1900, is a two-story building of white limestone, occupied by the Department of Mechanics and Astronomy.

The Men's Gymnasium, a large frame building finished in 1896, is used also as an assembly hall for public exercises and entertainments.

Science Hall, built in 1903 of limestone, is one of the largest buildings on the campus, and is occupied by the Departments of Physics, Philosophy, Education, Geology, Anatomy, and Physiology.

The *Library Building* is just completed, and will house also the collections of the Department of Fine Arts.

A Student Building of white limestone contains an east wing for men students, a west wing for women students (including the Women's gymnasium and swimming pool), and a small auditorium in the center seating 600 persons.

For an account of the buildings of the Biological Station see under the Department of Zoölogy.

The Library. The Library of Indiana University at present contains sixty-four thousand catalogued volumes. The selection of these books has been made by experts within the last twenty-two years with a view to facilitating instruction and research. While the collection is a

well-balanced one, it is especially strong in literary and scientific periodicals. The list of periodicals received and permanently kept on file by the library numbers about four hundred publications, including American, English, German, and French, and one each of Italian, Spanish, and Swedish. The library is made thoroughly usable by a carefully-made card catalogue, by indexes, and other bibliographical aids. The Library force consists of a librarian and ten assistants, all of whom are at the service of any authorized user of the library.

In the library building are seminary rooms for the Departments of History, Economics, English, Philosophy, Romance Languages, Education, Latin and Greek.

In addition to the central library where the general, literary, and historical collections are housed, there are nine departmental collections of varying sizes kept in the different University buildings.

All books, with the exception of periodicals and books reserved for reference, may be drawn for home use, each student having the privilege of drawing three books for two weeks.

The Library is open Mondays to Fridays from 7:45 a.m. to 10:00 p.m., and Saturdays from 8:00 a.m. to 5:00 p.m.

DEPARTMENTAL CLUBS

The Physics Club, an organization of the teachers and advanced students of the Physics Department, meets fortnightly to hear reports on research work and to discuss recent advances in physical science.

A History Club, composed of the History faculty, seniors majoring in History, and such other students as may be elected to membership, meets fortnightly to dis-

cuss topics of historical interest and to promote social intercourse.

The Philosophy Club, composed of instructors and students of the Department of Philosophy, holds fortnightly meetings for the discussion of philosophical questions.

The English Club, consisting of the English instructors, students who have English as their major, and such other students as may be elected to membership, meets three times each term. The purpose of the club is to promote good fellowship.

The Euclidian Circle is a mathematical club made up of instructors and students above Freshman rank. Its meetings are held on the second and fourth Mondays of each month.

The Goethe Gesellschaft is a club composed of men and women interested in German, and has for its object the practical study of the German language and the promotion of the social advantages of its members.

The Cercle Français, reorganized in 1905, is a club open to all members of the Department of Romance Languages past the Freshman year, and twice a month holds social gatherings at which French alone is spoken.

The Zoölogical Club, organized in 1882, meets every Monday during term time.

The Geological Club, organized in 1907, meets on alternate Wednesdays during term time.

VII. DEGREES

Two advanced degrees, Master of Arts and Doctor of Philosophy, are conferred by the University.

Master of Arts. The degree of Master of Arts may be conferred upon graduates of this University, or of any other institution of the same standing, upon the completion in residence of fifteen hours a term, carried during at least one entire college year. Thirty of the total of forty-five hours must be in one Department, or in closely allied Departments. Fifteen hours must be distinctly graduate in character.

Of the required year of residence, graduates of other institutions shall take at least two terms in succession.

The Master's degree may be conferred upon graduates of this University upon the completion in absence of fifteen hours a term, or equivalent work, carried during at least two full years under the direction of the Faculty, hours of private work done in absence being estimated at one-half the credit value of work done at the University.

Professional studies are not accepted for this degree, but research work on professional subjects may be accepted at the option of the professor in charge of the major subject.

A thesis may be required at the option of the professor in charge of the major subject.

Doctor of Philosophy. The degree of Doctor of Philosophy may be conferred upon graduates of this University, or of any institution of similar character and rank, upon the completion of an advanced course of study of no less than three years. On the recommendation of the professor in charge of the major subject and with the concurrence of the Committee on Advanced Degrees, part of this time may be spent in study at other universities.

The course of study for the degree of Doctor of Philosophy must be pursued under the direction of a committee consisting of the heads of the Departments in which the work is done, and its value shall be determined by a final examination and by the presentation of a satis-

factory thesis, usually embodying original work upon some prescribed or accepted subject, and which must always give evidence that the candidate is capable of forming an independent judgment upon the recent literature of his department. In each case a detailed statement, independent by the professor in charge of the major work, shall be submitted to the Committee on Advanced Degrees not later than May 10 of the year in which the candidate presents himself for examination.

The thesis of every candidate for the degree of Doctor of Philosophy shall be presented to the Committee on Advanced Degrees on or before the first day of June of the year in which he proposes to take the degree. The thesis shall be indorsed by the head of the Department as being in its final form and ready for the press. Examinations of each candidate for this degree will be conducted before a committee consisting of all the instructors under whom graduate work has been taken. If the candidate is recommended for the degree, arrangements must be made to deposit five printed copies of the thesis in the library before the degree is conferred.

At least one year before the final examination the candidate shall satisfy the professor in charge of the major subject of his ability to use French and German for purposes of investigation.

VIII. APPLICATION FOR DEGREES

Application for the degree Master of Arts must be filed with the Dean at least three months before the time when the degree is to be given. Application for the degree Doctor of Philosophy must be on file at least one year before the candidate is admitted to the examination.

IX. SCHOLARSHIPS AND TEACHING FELLOWSHIPS

A number of scholarships and teaching fellowships are available for graduate students.

Scholars will be given an opportunity to gain a familiarity with the departmental work and administration which can not be obtained in any of the regular courses. To this end the scholar may be given an opportunity to assist in laboratory courses, to supervise departmental libraries and to assist in museum administration. Scholars, aside from being relieved from the payment of all contingent and laboratory fees, will receive no remuneration.

Teaching Fellows will be required to render service to the University as assistants, tutors, or instructors.

The Teaching Fellows are relieved from all term fees and the fellowship carries with it an honorarium of between \$200.00 and \$500.00 annually. The highest amount will ordinarily be paid only if the incumbent is appointed for a third year. A Teaching Fellowship is primarily a recognition of scholarship. Not less than two-thirds of each Fellow's time must be devoted to work leading to the Doctorate in Philosophy.

A Fellow may be appointed for three separate years, but not for more. Appointments are for one year, and do not imply a reappointment.

Following is the list of Teaching Fellows for 1907-08:

CHARLES BURGESS AUSTIN, A.B., Teaching Fellow in Economics.
WILLIAM ALLEN AUSTIN, A.B., Teaching Fellow in Mathematics.
Joseph Valentine Breitwieser, A.B., Teaching Fellow in Philosophy.

Albert Harvey Cole, A.B., Teaching Fellow in Public Speaking.

Anna Breckman Collins, A.B., Critic Teacher in English.

Max Mapes Ellis, A.B., Teaching Fellow in Zoölogy.

Walter Lewis Hahn, A.M., Teaching Fellow in Zoölogy and Assistant in the Museum.

LEWIS LEROY HALL, A.B., Teaching Fellow in Chemistry.

CECILIA BARBARA HENNEL, A.B., Teaching Fellow in English.

CORA BARBARA HENNEL, Teaching Fellow in Mathematics.

MARY HORNER, A.B., Teaching Fellow in German. (Spring term.)

George Alexander Hutchinson, A.B., Teaching Fellow in Philosophy.

Ballington Charles Kettleborough, A.B., Teaching Fellow in History. (Winter and Spring terms.)

ROBERT KUIPER, A.B., Teaching Fellow in Latin.

ISAAC MCKINNEY LEWIS, A.M., Teaching Fellow in Botany.

WALTER D. MARTIN, B.S., M.D., Teaching Fellow in Pathology.

ARTHUR LEROY MURRAY, A.B., Teaching Fellow in English.

Paul Christian Phillips, A.B., Teaching Fellow in History. (Fall term.)

WILL SCOTT, A.B., Research Assistant in charge of Donaldson Farm. ARTHUR BIVINS STONEX, A.M., Teaching Fellow in English.

ANDREW TENNANT WYLIF, A.M., Teaching Fellow in English.

Departmental Equipments and Courses of Study

Besides advanced work the lists which follow include also brief statements of the undergraduate courses. These will be found fully described in the Catalogue of the University. Entrance to the graduate studies in any Department, unless otherwise stated, implies the completion of 45 hours selected from the undergraduate courses here listed. In many cases some of the advanced undergraduate courses can profitably be taken by graduate students.

DEPARTMENT OF GREEK

Horace A. Hoffman, Professor. Frank W. Tilden, Associate Professor.

Undergraduates choosing Greek as their major subject are required to take sixty hours' work in the Department, selected after consultation with the professor.

The time that at the present may be profitably devoted to graduate work in Greek is one year, leading to the degree of A.M.

The Department is well equipped for doing thoroughly satisfactory work leading to the degree of Master of Arts. Besides the most important reference books, cyclopaedias, dictionaries, lexicons, indexes, and standard editions of Greek writers, an effort has been made to build up an especially good collection of works treating of Euripides, since seminary work is offered in that author. The Department has the chief older editions as well as nearly all

of the later ones, and many special works bearing on Euripides.

The Library contains the most important classical journals, among them complete sets of 'The American Journal of Philology'; 'The American Journal of Archaeology'; 'The Classical Review'; Chicago, Cornell, and Harvard Studies; 'Hermes'; 'Jahrbücher für classische Philologie'; Mittheilungen d. deutsch. arch. Inst. in Athen'; 'Philologus'; and 'Rheinisches Museum.'

Among the most valuable works in the field of Archaeology and Art the following may be named: 'Antike Denkmäler'; 'Ausgrabungen von Olympia'; 'Carapanos'; 'Dodona'; Hamdey-Bey and Reinach's 'Nécropole à Sidon'; Homolle's 'Fouilles de Delphes'; Ohnefalsch-Richter's 'Cypros, die Bibel und Homer'; Overbeck's 'Griechische Kunstmythologie'; Stackelberg's 'Die Gräber der Hellenen'; and the publications of the American and British Schools at Athens, and of the Egyptian Exploration Fund. Among the works on Inscriptions and Epigraphy the following may be mentioned: 'Corpus Inscriptionum Graecarum'; 'Corpus Inscriptionum Atticarum'; Inscr. Graec. Septentrionalis, Siciliae, Italiae, Pelopon., Insularum, etc., and the important writings of such authorities as Klein, Kretschmer, Meisterhans, etc. For Palaeography and the study of the Papyri are the following: Works by Grenfell, Hunt, Kenyon, Mahaffy, Mayser, Mitteis, Thompson and Wilkin. In the important field of vase-painting, the Library contains many valuable works. Among the most noteworthy are: Benndorf's 'Griechische und Sicilische Vasenbilder'; Collignon and Rayet's 'Histoire de la Céramique grecque'; Dechelette's 'Les Vases ceramiques ornés de la Gaule romaine'; Furtwängler and Loeschke's 'Mykenische Vasen,' and

'Mykenische Thongefässe'; Furtwängler and Reichhold's 'Griechische Vasenmalerei'; Harrison & McColl's 'Types of Green Vases,' and various books by Gardner, Huddilston, Klein, Kretschmer, Murray, Smith and Walters.

The Department also owns upwards of 700 photographs of landscapes, buildings and works of art in Greece, Italy and Sicily; and has many lantern-slides, busts, casts, a model of the Acropolis at Athens, and a series of reproductions of the famous Tanagra Figurines.

COURSES FOR UNDERGRADUATES

- 1. Elementary Greek, 15 hours.
- 3. Xenophon: 'Hellenica'. 3 hours.
- 4. Xenophon: Anabasis, Composition. 2 hours.
- 5a. Homer: 'Iliad'. Selected portions. 6 hours.
- 5b. Euripides: 'The Medea'. 3 hours.
- 6a. Selected Prose Readings. 2 hours.
- 6b. Homer: 'Odyssey'. 2 hours.
- 9. Lyric and Dramatic Poetry. 15 hours.
- 12. Philosophical Prose. 6 hours.
- 13. Historical and Rhetorical Prose. 9 hours.
- 14. Greek Life. 3 hours.
- 16. Greek Words in English. 3 hours.
- 17. Greek Testament and Church Fathers. 9 hours.
- 18. Greek Literature in English. 9 hours.

COURSE FOR GRADUATES

Graduate Seminary: Euripides. A. Wednesdays: "The Phenicians". Professor Hoffman. B. Fridays: "The Alcestis". Associate Professor Tilden.

Fall, Winter, and Spring terms, W. F., 3:00 to 5:00.

Open to graduates only. A reading knowledge of German is a requisite for the work.

DEPARTMENT OF LATIN

Harold Whetstone Johnston, Professor of Latin. Lillian Gay Berry, Associate Professor.

——————————————, Instructor.

The Department is adequately equipped for the courses offered below. Besides sets of Classical journals and reviews (see the detailed statement above under the Department of Greek), the library contains the essential works of reference on the various disciplines, all general and special lexicons and indexes of recognized value, various sets of texts, the latest critical editions and commentaries, together with many of historical interest, and collections of monographs and dissertations intended to illustrate those authors that are made the subjects of special investigation and seminary work. The Department has an office and two recitation rooms in Kirkwood Hall, and shares with the Department of Greek a seminary room in the Library. The private library of the head of the Department is at the service of graduate students.

The following courses are offered:

COURSES FOR UNDERGRADUATES

- 11. Cicero, Livy, and Terence. 9 hours.
- 12. Composition. 3 hours.
- 13. Private Antiquities. 3 hours.
- 26. Horace, Tacitus, and Pliny. 9 hours.
- 27. Grammar. 3 hours.
- 28. Paleography and Criticism. 3 hours.
- 31. History of Literature. 3 hours.
- 32. Epigraphy. 3 hours.

COURSES FOR UNDERGRADUATES AND GRADUATES.

33. The Prose Writers of the Republic. Selections from Cato, Sallust, Cicero, and Hirtius, with the critical study of the text of one of these authors so far as it is read in the class. Students are expected to be able to-read German. Professor Johnston.

Fall, Winter, and Spring terms, M. W. F., at 9:00.

[34. The Poets of the Republic. Selection from Plautus, Terence, Lucretius, and Catullus, with the critical study of the text of some one of these authors so far as read in the class. Courses 33 and 34 are given in alternate years.]

Omitted in 1908-09.

COURSES FOR GRADUATES

If Course 33 is taken in the undergraduate course, Course 34 should be made a part, of the graduate work, and vice versa.

41. The Topography and Monuments of Ancient Rome. Recitations, lectures, and assigned readings. Associate Professor Berry. Fall, Winter, and Spring terms, once a week, at an hour to be arranged.

Platner, 'Ancient Rome'.

Open to graduate students only.

42. Readings in Latin Literature. The student will be guided and assisted in reading very considerable portions of those authors not included in other courses, with stress laid upon the subject matter rather than upon the language and style. Analyses and summaries will be prepared by the students and criticised by the instructor. Professor Johnston and Associate Professor Berry.

Fall, Winter, and Spring terms, once a week, at an hour to be arranged.

Open to graduate students only.

 Advanced Composition. This course is intended especially for teachers, but may be taken by any persons who need practice in writing Latin. Professor Johnston and Mr. ———. Fall, Winter, and Spring terms, once a week, at an hour to be arranged,

Open to graduates and teachers of Latin.

50. Seminary. The critical study of the text of some standard author, with incidental investigation of problems in syntax, style, prosody, and so forth. In past years Caesar, Sallust, Tacitus, and Plautus have been made the subjects of similar work. In 1908-09 it is proposed to make a study of Terence. The student should be provided with the critical edition of Umpfenbach and the text editions of Dziatzko and Fleckeisen. Professor Johnston.

Fall, Winter, and Spring terms, M., 2:00 to 3:50. Open to students who have had one year's graduate work.

DEPARTMENT OF ROMANCE LANGUAGES

ALBERT F. KUERSTEINER, Professor of Romance Languages. George D. Morris, Associate Professor of French.

*Charles A. Mosemiller, Associate Professor of Romance Languages.

Undergraduates electing Romance Languages as their major subject are required to take sixty hours of work in the Department. The choice of courses must be approved by the head of the Department.

The Department offers one year of Graduate work, all in French.

The Library is well equipped with works in French criticism. It contains, moreover, all of the volumes of the 'Grands Ecrivains de la France' series published thus far, and complete sets of 'Romania,' 'Archiv für das Studium der Neueren Sprachen,' 'Französische Studien,' 'Revue des deux Mondes,' 'Revue de Cours et Conférences,' 'Biblioteca de Autores Españoles,' besides a fair selection of works in French and Spanish literature. A complete set

^{*}To be absent on leave, for one year, from August 1, 1908.

of the 'Zeitschrift für Romanische Philologie,' belonging to the head of the Department, is also at the disposal of students.

Professor C. A. Mosemiller has published in 'Modern Language Notes' the following articles: November, 1903, 'Etymology of son': February, 1904, 'Etymology of canneberge'; December, 1905, 'Etymology of mâche-fer'; May, 1907, 'Etymologies of cotret, dèche, palier, sablière'; May, 1908, 'Trumeau, trumer, trimer et quelques autres dérivés du latin torus en Gaule.'

Following are the courses of the Department:

COURSES FOR UNDERGRADUATES

- 1. Elementary French. 15 hours.
- 4. Grammar and Composition. 6 hours.
- 19. Second Year Reading. 9 hours.
 - 7. Seventeenth Century Poetry and Drama. 9 hours.
- 11. Seventeenth Century Prose. 6 hours.
- 24. Eighteenth Century Poetry and Drama. 9 hours.
- 25. Eighteenth Century Prose. 6 hours.
- 10. Nineteenth Century; the Romantic Period. 9 hours.
- 27. Nineteenth Century; the Realistic Period. 9 hours.
- 26. Advanced Composition. 6 hours.
- 15. Elementary Spanish. 15 hours.
- 20. Advanced Spanish. 9 hours.

COURSES FOR GRADUATES AND UNDERGRADUATES

13. Old French. Reading of texts; study of derivations, and an exposition of the simpler phonetic laws involved in the change from Popular Latin into Old French and Modern French. Lectures. Professor Kuersteiner.

Fall, Winter, and Spring terms. T. Th., at 9:00.

- Paris, 'Extraits de la Chanson de Roland'; Suchier, 'Aucassin et Nicolete' (French edition); Paris-Langlois, 'Chrestomathie du Moyen Age'.
- Open to graduate students who have studied French and Latin, and also to undergraduates who have passed in Courses 4 and 19.
- [28. Senior Composition. Drill in translation of literary English into literary French. Writing of French themes and letters. The work is conducted in French. Associate Professor MOSEMILLER.

Fall, Winter, and Spring terms. T. Th., at 3:00.

Open to students who have passed in Courses 1, 4, and 26, or their equivalent.]

Omitted in 1908-09.

DEPARTMENT OF GERMAN

BERT J. Vos, Professor.
CARL OSTHAUS, Professor.
EUGENE LESER, Assistant Professor.

Undergraduates who choose German as their major subject must make a minimum of sixty hours' credit in this Department, the equivalent of a four years' course of five hours a week. They are expected to consult with the head of the Department in the selection of their other studies, as well as in the arrangement of their work within the Department.

Courses 6, 8, 9, 10, and 14, and Education 13 (German) constitute the fourth year work. The courses in Gothic, Old High German, and Middle High German, given in the Department of Comparative Philology, will count as graduate, or (under certain conditions), as fourth year courses in German.

COURSES FOR UNDERGRADUATES

- 1. Elementary German. 15 hours.
- 2. Second Year Composition. 6 hours.
- 3. Classical German Authors. 9 hours.
- 4. Modern German Authors. 9 hours.
- 5. Third Year Composition. 6 hours.
- 7. Advanced German Classics. 9 hours.
- 16. German Lyric Poetry. 6 hours.
- 8. Advanced Composition. 6 hours.
- 6. History of German Literature. 9 hours.
- 9. Goethe: 'Faust'. 9 hours.
- 10. History of German Literature. 6 hours.

COURSES FOR GRADUATES AND UNDERGRADUATES

14. German Usage. A study of difficult points in German grammar, with reference to the spoken language of the present day and to the usage of representative authors. Designed especially for students who intend to teach German. Assistant Professor Leser.

Winter and Spring terms, T. Th., at an hour to be appointed. Matthias, 'Sprachleben und Sprachschäden'.

Open to students who have had the equivalent of three years' work in German.

COURSES FOR GRADUATES

For Gothic, Old High German, and Middle High German, see Course 4, of the Department of Comparative Philology. Course 14 may be taken either as a graduate or undergraduate course.

[19] German Romanticism. Lectures, discussions, and reports. Conducted in German.

Fall, Winter, and Spring terms, M. W. F., at 10:00,

Open to students who have had the equivalent of four years' work in German.]

Omitted in 1908-09.

[20. Lessing: Life and Works. Lectures, and reports by members of the class upon subjects assigned for special study. Conducted in German.

Fall, Winter, and Spring terms, M. W. F., at 10:00.

Open to students who have had the equivalent of four years' work in German.]

Omitted in 1908-09.

22.

- [21. Studies in the recent German Drama. Conducted in German. Fall, Winter, and Spring terms, T. Th., at 8:00. Open to students who have had the equivalent of four years' work in German.]
 Omitted in 1908-09.
 - Schiller's Dramas. Professor Vos.

 Fall, Winter, and Spring terms, at an hour to be arranged.

 Open to students who have had the equivalent of four years' work in German.

Seminary in German Literature. Goethe's Lyrical Poems;

DEPARTMENT OF COMPARATIVE PHILOLOGY

Guido H. Stempel, Associate Professor.

The degree of A.B. in Comparative Philology may be conferred upon students who have a grounding in at least two foreign languages. The major requirement will be forty-five hours in this Department, including Courses 1 and 2.

The graduate courses offered will be extended as required. They may be supplemented by certain of the courses listed as undergraduate, as well as by certain courses given in the other language Departments and in History, Social Science (anthropology), Philosophy, and [5—18519]

English. The time that can profitably be spent here in graduate study in philology is at present about two years.

The University Library contains about 2,000 volumes of philology. Upwards of fifty languages are represented, and a third of these have their history and cognate relationships fully illustrated. The chief philological periodicals and many of the other serial publications are on the shelves, quite generally in complete files. It may perhaps be said that the student of philology has access to a fairly complete working library.

UNDERGRADUATE COURSES

- 1. The English Language. 9 hours.
- 2. Old English. 9 hours.
- 3. Middle English. 6 hours.
- 6. Ballad and Epic. 6 hours.
- 7. The Latin Language. 6 hours.

GRADUATE COURSES

- 4. Comparative Philology of the Germanic Dialects. One or two of the dialects-Gothic, Old Norse, Old Saxon, Old and Middle High German-will be studied with reference to English and (if the constituency of the class admits) German. Grammar and reading, linguistic interpretation, and reports on such special topics as mythology, customs, traditions, the beginnings of national life, etc. Associate Professor Stempel.
 - Fall, Winter, and Spring terms, T. Th., at 10:00.
 - Wright, 'Primer of the Gothic Language'; Sweet, 'Icelandic Primer': Holthausen, 'Altsächsisches Elementarbuch'; Wright, 'Old High German Primer'; Wright, 'Middle High German Primer'; Zarncke, 'Das Nibelungenlied'; selected monographs from Paul, Grundriss der germanischen Philologie'.
 - Open to students who have passed in Courses 2 and 3, and in thirty hours of language, and to others at the option of the instructor.

Comparative Philology of the Classical Languages. An advanced course in the science of language and Indo-European philology. Each student will emphasize the particular language in which he has had special training. Associate Professor Stempel.

Fall, Winter, and Spring terms, M. W. F., at 10:00.

Giles, 'Manual of Comparative Philology for Classical Students'.

Open to students who have passed in Courses 2 and 3, and in thirty hours of language, and to advanced students in Latin or Greek.

[8. Sanskrit. Elements of grammar, reading of selected texts, and comparative study of sounds and inflections. Mr. ———.

Fall, Winter, and Spring terms, M. W. F., at 10:00.

Thumb, 'Handbuch des Sanskrit, I'; Lanman, 'Sanskrit Reader'.

Open to Seniors and graduate students in Comparative Philology or the languages.]

Omitted in 1908-09.

DEPARTMENT OF ENGLISH

WILL D. HOWE, Professor of English.

*CHARLES J. SEMBOWER, Associate Professor of English.

HENRY T. STEPHENSON, Associate Professor of English.

Frank Aydelotte, Associate Professor of English.

EDWARD P. MORTON, Assistant Professor of English.

Undergraduate students who select the work of this Department for their major subject must take forty-five hours in English and thirty hours of collateral work approved by the Department. Not more than fifteen hours of Public Speaking may be taken as collateral.

At present, two years may be spent with profit in pursuing the work which will lead toward the degree of Doctor of Philosophy. The Library is equipped for re-

^{*}Absent on leave, from August 1, 1907.

search work in several periods, is well provided with the principal periodicals and with the publications of most of the learned societies. The instructors of the Department will gladly direct competent advanced students in lines of investigation and research.

COURSES FOR UNDERGRADUATES

- 1. Elementary Composition. 6 hours.
- 11. Composition. 6 hours.
- 15. Advanced Composition. 6 hours.
 - 2. History and Development of English Literature. 9 hours.
 - 6. Literary History of America. 9 hours.
 - 3. Nineteenth Century Prose. 6 hours.
- 20. Shakspere, Milton, Spenser, Browning, Tennyson. 9 hours.
- 39. The Novel. 6 hours.
 - Burns, Wordsworth, Scott, Coleridge, Byron, Shelley, Keats.
 9 hours.
 - 9. Elizabethan Drama. 9 hours.

COURSES FOR GRADUATES AND UNDERGRADUATES

- [17. Metrics. A study of modern English metre.] Omitted in 1908-09.
- [33. Literary Criticism. A study of the history and principles of literary criticism. Lectures and reports.]
 Omitted in 1908-09.
- [41. The Anglo-Saxon Period. A historical survey of the literature from its beginnings to Chaucer's time. Discussion of Anglo-Saxon prose and poetry, and the literary forms of Middle English literature.]

Fall term, T. Th., at 9:00. Omitted in 1908-09.

42. Chaucer, 'Piers Plowman', and other Contemporary works.

Reading of the minor poems, 'Troilus and Cressida', five or six of the 'Canterbury Tales' by Chaucer; a text of 'Piers Plowman', and other selections from the period. Associate Professor AYDELOTTE.

Fall, Winter, and Spring terms, M. W. F., at 10:00.

43. 'The Elizabethan Age: - Non-dramatic. From the appearance of Tottel's 'Miscellany' (1557) to the closing of the theaters (1642). A study of the various literary forms and works (exclusive of the drama) of the Elizabethan period, with especial emphasis upon Spenser, Sidney, Bacon, Jonson, Hooker, Lyly, Greene, Lodge, Nash, Dekker. The pamphlets of the time will especially be considered. Associate Professor Aydelotte.

Fall, Winter, and Spring terms, T. Th., at 10:00.

[44. The Age of Milton and the Age of Dryden (1642-1700). A study of the lyric poets of the Caroline period, of the Restoration drama, and of the chief works in prose in the seventeenth century.

Winter term, T. Th., at 9:00.] Omitted in 1908-09.

45. The Eighteenth Century (1700-1770). A study of the rise of prose, the essay, the magazine, the novel, and the beginnings of romanticism, with especial regard to Addison, Steele, Swift, Defoe, Pope, Jonson, Goldsmith, Gray. Lectures and collateral reading. Each student will prepare one long paper each term. Professor Howe.

Fall and Winter terms, T. Th., at 9:00.

46. The Romantic Period, to the death of Scott (1770-1832). The literature of the romantic period in its various forms. An attempt will be made to present the new movement as it developed in England, France, and Germany. Special stress will be laid upon Burns, Wordsworth, Scott, Coleridge, Byron, and Shelley. Professor Howe.

Spring term, T. Th., at 9:00.

- [47. The Victorian Period (1832-1900). A survey of the literary movements in England and America during the nineteenth century, with much reading from representative authors.
 Spring term, T. Th., at 9:00.]
 Omitted in 1908-09.
 - 35. Composition Seminary. A course in writing, restricted to those who have passed with distinction in Course 15. Professor Howe, Associate Professors Stephenson and Aydelotte. Fall, Winter, and Spring terms, two hours one afternoon each week.
 - 12. Literary Seminary. Research Course. Sections limited to fifteen students will be formed to study various literary problems. In 1907-08 the following subjects were discussed: The Arthurian story in its various forms; the beginnings of the English drama; the dramas of Browning; the question of literary appreciation and interpretation. Sections will be directed by Professor Howe, and Associate Professors Stephenson and Aydelotte.
 - Fall, Winter, and Spring terms, two hours, one afternoon each week.
 - 25. Biblography of English Literature. This course will present rapidly the subject of English literature from its bibliographical side. Professor Howe, Associate Professor Stephenson and Aydelotte, and Assistant Professor Morton. Spring term, two hours.
 - 48. Courses of Special Study. The Department will encourage special study in the literature of any period or in topics which may be pursued with profit.

DEPARTMENT OF HISTORY AND POLITICAL SCIENCE

James A. Woodburn, Professor of American History and Politics. Samuel B. Harding, Professor of European History.

Amos S. Hershey, Professor of Political Science and International Law.

*THOMAS L. HARRIS, Instructor.

Solon J. Buck, Instructor.

Undergraduates selecting the work of this Department for their major subject must take forty-five hours in History and thirty hours collateral work approved by the Department. The latter must include Course 1 of the Department of Economics, and may include a maximum of fifteen hours selected from the courses in Political Science offered by this Department.

The Department is prepared to offer research work leading to the A.M. and Ph.D. in the following fields: American Colonial History, the American Civil War and Reconstruction, English History in the Seventeenth and Nineteenth Centuries, the French Revolution, Diplomatic History, and International Law. In each of these fields good library collections are already at hand, and are constantly being added to.

COURSES FOR UNDERGRADUATES

- 1. Mediæval and Modern European History: Introductory Course.
 9 hours.
- 2. Greek History. 6 hours.
- [3. Roman History, 6 hours. Omitted in 1908-09.]
- 6. English History. 9 hours.
- 10. History of Modern Europe. 6 hours.
- 8. American Colonial History. 6 hours.
- 18. American Political History, 1783-1876. 9 hours.
- 21. The American Commonwealth. 9 hours.
- 23. European Politics 6 hours.

^{*}On leave of absence, 1908-09.

COURSES FOR GRADUATES AND UNDERGRADUATES

 Renaissance and Reformation, 1300-1555. Lectures, text-book study, collateral reading, and preparation of papers. The conciliar movement for reform; the Renaissance in Italy and Germany; the Protestant revolution in Germany, Switzerland, and France; the Council of Trent and the counter-reformation; the religious peace of Augsburg. Professor Harding.

Fall, Winter, and Spring terms, M. W., at 11:00. Should be accompanied by Fine Arts 4, F., at 11:00.

13. France in the Middle Ages. A study of the institutions of mediæval France, and of the processes whereby the feudal type of society was transformed into the modern state. Lectures, collateral reading, and reports on assigned topics. Professor HARDING.

Fall and Winter terms, T. Th., at 11:00.

 Historical Method. The principles of historical investigation, with some practice in the use of sources and the preparation of papers. Professor Harding.

Spring term, T. Th., at 9:00.

Langlois and Seignobos's 'Introduction to the Study of History'; book of texts to be selected.

American Diplomatic History, 1776-1876. A study of the subjects of chief importance in the international relations of the United States from the time of the Declaration of Independence. Mr. Buck.

Fall, Winter, and Spring terms, T. Th., at 8:00.

28. American Political Discussions. A study of some of the more notable contributions to political and constitutional controversies in the national period of American history. Designed to introduce the student to a first-hand knowledge of the materials relating to the leading issues in our national development. Professor Woodburn.

Fall, Winter, and Spring terms, T. Th., at 9:00. Presupposes Course 18 or its equivalent.

20a. Seminary in English History. Individual research work, under the guidance of the instructor, on some subject connected with modern English history. The results of the investigations are presented from time to time as reports and are finally embodied in papers in form suitable for publication, of which a copy must be left with the Seminary. Professor HARDING.

Fall, Winter, and Spring terms. Hours for individual conference to be arranged.

20c. Seminary in American Constitutional and Political History. In 1908-09 the period of the Civil War will be studied. Study of the sources, reports of investigations, and thesis work. Professor Woodburn.

Fall, Winter, and Spring terms, M., at 4:00 to 5:30. Open to advanced students and graduates.

24. History of Political Ideas and Theory of the State. A study of the nature, origin, form, and functions of the state, together with an analysis of the structure and province of government. A brief sketch or outline of the history of political ideas or theories will also be given. Professor Hershey.

Spring term, M. W. F., at 11:00.

Open to students who have passed in Course 23, or have had the equivalent of two years' work in History, Law, or Economics.

Pollock, 'History of Political Ideas'; Leacock, 'Elements of Political Science.'

25. Public International Law. Subjects of international law; rights and duties of states in their normal relations; intervention; principles governing states in time of war; the law of neutrality; territorial property and jurisdiction; territorial waters; high seas; contraband; blockade, etc. Text-book work, lectures, and the study of cases and illustrations drawn from the Russo-Japanese War. Intended primarily for the Third year class in the School of Law, and Seniors and graduate students in history. Professor Hershey.

Fall, Winter, and Spring terms, T. Th., at an hour to be appointed.

Lawrence, 'International Law'; Hershey, 'The International Law and Diplomacy of the Russo-Japanese War',

20d. Seminary in International Law and Diplomacy. Research work and the special study of important topics, more especially of present day problems. During recent years such subjects were selected as the Alabama Claims, the Panama Affair, the causes of the Russo-Japanese War, the 'Open Door' policy in China, and the genesis of the Monroe Doctrine. Professor Hershey.

Fall, Winter, and Spring terms, at hours to be appointed. Open to Seniors and graduate students.

DEPARTMENT OF ECONOMICS AND SOCIAL SCIENCE

ULYSSES G. WEATHERLY, Professor of Economics and Social Science. WILLIAM A. RAWLES, Professor of Political Economy.

Undergraduates selecting Economics and Social Science as their major subject are required to take nine terms of daily work (forty-five hours) in the Department. Of the elective work in other Departments at least three terms should be in History and Political Science, and it is strongly urged that one course of this work be taken in the Freshman year, before the work in Economics is begun.

The courses in the Department fall into two groups, adjusted to the needs of those students whose interest lies primarily in the field of Economics or of those who wish to work chiefly in Sociology. The graduate work in both lines centers in Courses 8 and 8a. The Department Library is equipped with full sets of the most important public documents, both state and national, and has complete sets of most of the American, English, French and German economic periodicals. Advanced students have direct access to these materials, and also to the special collections relating to charitable and correctional institutions. The Department is affiliated with the Charity Or-

ganization Society of Indianapolis, and through this means properly qualified students are enabled to come into direct contact with the social and economic problems of that city. Constant use is also made of the statistical materials in the various departments of the State government, and also in the State Library.

The following courses are designed to furnish the work for the Master's Degree. In certain cases a second year of graduate study may be taken with advantage.

COURSES FOR UNDERGRADUATES

- 1. Political Economy. 6 hours.
- 2. Economic History of England. 2 hours.
- 15. Economic History of the United States. 4 hours.
- 12. Principles of Commerce. 3 hours.
- 13. Commercial Geography. 3 hours.
- 25. Accounting and Business Practice. 6 hours.
- 27. Business Organization and Management. 3 hours.
- 28. Insurance, 3 hours.
- 29. Corporation Economics. 9 hours.

COURSES FOR UNDERGRADUATES AND GRADUATES

6. Money, Banking, and the Money Market. (1) Fall term: Money. General monetary principles and such special subjects as bimetallism, the standard of deferred payments, and the present monetary situation in the United States. (2) Winter term: Banking. History and theory of banking and credit operations, followed by a study of the banking systems of the leading foreign states, and of the recent proposals of banking reforms in the United States. (3) Spring term: The Money Market. A study of the rates of discount and exchange (domestic and foreign), the functions of bill brokers, international payments, financial panics and crises, financial aspects of stock and produce exchanges, and

London and New York as centers of financial operations. Lectures, text-books, and special reports. Professor RAWLES, Fall, Winter, and Spring terms, T. Th., at 8:00.

3. Public Finance. A study of the revenues and expenditures of the various political units, local, state, and national, and the leading features of financial administration, taxation, and public debts. A detailed study will be made of the tax system of Indiana. The financial history of the United States, with especial attention to the currency, taxation, and banking institutions. Lectures, text-books and collateral readings. Professor RAWLES.

Fall, Winter, and Spring terms, M. W. F., at 8:00.

 Transportation. An historical survey of the means and methods of transportation, followed by a study of the economic and social bearings of the present transportation question. Professor RAWLES.

Spring term, M. W. F., at 9:00.

20. Ethnology. The origin and antiquity of man; physical characteristics of race as a basis of race classification; social and psychic characteristics in relation to material civilization; race geography. Professor Weatherly.

Fall term, T. Th., at 10:00.

21. Comparative Sociology: The problem of the family. Historical evolution of the family; types of marriage and of kinship; present status of opinion as to the primitive family; the divorce problem, and the economic and social position of woman. Professor Weatherly.

Winter term, T. Th., at 10:00.

23. Demography of the United States. Racial ingredients of the national population; problems of race contact and assimilation; special problems connected with immigration and naturalization; the negro problem; the movements of population. Professor Weatherly.

Spring term, T. Th., at 10:00.

4a. Social Pathology: Pauperism and charities. A general introduction to the study of the degenerate classes; the causes of dependence; a comparative study of modern modes of dealing with the defective and dependent classes; charity organization, and the most recent developments in preventive philanthropy. Professor Weatherly.

Fall term, M. W. F., at 10:00.

4b. Social Pathology: Crime and penology. Nature and causes of crime; an examination of criminal anthropology; the historical development of penology; the reformatory system, the juvenile court and probation system; the leading problems of criminal jurisprudence. The class will make a two days' visit to the benevolent and penal institutions at Indianapolis. Professor Weatherly.

Winter term, M. W. F., at 10:00.

Open to third and fourth year students in Economics, History, Philosophy, and Law.

4c. Social Pathology: Special problems. In 1908-09 the subject of the course will be the liquor problem and social betterment. Other topics to be taken up from year to year will be industrial betterment, and the special questions of municipal sociology. Professor Weatherly.

Spring term, M. W. F., at 10:00.

10. Socialism and Social Reform. A historical study of utopian social philosophy and of the growth of scientific socialism; the origin and present position of Marxian socialism; American communistic experiments and movements for radical social reform. Professor Weatherly.

Fall term, T. Th., at 11:00.

16. Industrial Society. An examination of certain recent theories of distribution with special reference to their bearing on the social aspects of industry; in the study of the questions at issue between capital and labor emphasis is laid on the growing recognition of society's paramount interest. Professor Weatherly.

Winter term, T. Th., at 11:00.

 General Sociology. A summary of social forces and an attempt to formulate certain principles of social action; a careful analysis and criticism is made of those trends of sociological speculation which give most promise of being permanently fruitful. Professor Weatherly.

Spring term, T. Th., at 11:00.

COURSES FOR GRADUATES

8. Seminary in Economics and Sociology. Designed for advanced students who have shown the ability to undertake individual research. The subjects for investigation may be taken from the field of either Economics or Sociology, but it is intended that they shall have some degree of unity. Considerable attention is given to training in statistical methods. Each member is expected to prepare a thesis exhibiting the results of original research. Professors Weatherly and Rawles.

Fall, Winter, and Spring terms, two hours a week, at an hour to be appointed.

8a. Research. Special investigations upon economic or sociological subjects, directed toward the preparation of theses for the Master's degree. Hours and credit by individual arrangement.

DEPARTMENT OF PHILOSOPHY

ERNEST II. LINDLEY, Professor of Philosophy and Psychology. WARNER FITE, Professor of Philosophy.

WILLIAM L. BRYAN, Lecturer on Ethics.

JOHN A. BERGSTRÖM, Professor of Education and Director of the Psychological Laboratory.

JOSEPH V. BREITWIESER, Teaching Fellow.

GEORGE A. HUTCHINSON, Teaching Fellow.

No courses in this Department are open to Freshmen at the beginning of the College year. By special permission, Freshmen may be admitted to Course 3 (Winter and Spring terms), and to Course 1a (Spring term). All undergraduates are, however, strongly advised to defer election of work in this Department until the Sophomore year or later.

For students who take their major subject in this Department, the required work consists of Courses 1, 2, 3,

27, 4a, and Course 5 of the Department of Anatomy. Students desiring to give their chief attention to general philosophy may substitute Course 6a or 6b for Anatomy 5.

A Philosophy Club composed of instructors and students of the Department meets fortnightly. The object of the club is to afford free discussion of topics of philosophical interest which do not find a place in class-room work. All students who are credited with more than twenty hours' work in the Department, as well as all students who have chosen Philosophy as their major subject, are eligible to membership in the club.

The psychological laboratory occupies four large and twelve small rooms, of special construction, in Science Hall. Among those designed for special uses are a large dark-room for experiments on vision, equipped with large iris-diaphragm, arc-light, and heliostat attachments; a sound-proof room for the study of minimal auditory sensations; three small double rooms providing convenient isolation of subjects during experiments on reaction-time, circulation, etc. The laboratory is supplied throughout with water, gas, and electric light and power, and has apparatus for both practice and research courses. Besides the usual outfit for the study of sensation and perception, such as is required by Sanford's 'Manual', the laboratory is equipped with the following generally useful or special pieces: (1) For reaction-time experiments: the Hipp chronoscope, and ten pendulum chronoscopes,* together with the necessary electric keys, commutators, drop machines, sound keys, etc.; also two clocks* for giving various intervals in experiments by the continuous method. (2) For graphic work: the Marey and the Ludwig kymographs, a continuous paper kymograph, two simple

^{*}Designed and made in the Department.

spring-kymographs, an electric fork, the Kreonecker interrupter, the Jacques interval watch, together with the necessary receiving, transmitting, and writing apparatus: the Mosso plethysmograph, a pneumograph, the Verdin radial and carotid sphygmographs, the Runne sphygmograph, and a constant electric motor. (3) For the study of movement: myographs, a tapping machine,* and a general ergograph.* (4) For memory and association: a compound interrupter,* with drum and escapement, for experiments according to the Ebbinghaus method, together with the necessary syllable series, etc., and a large set of interference cards. (5) Miscellaneous: apparatus for testing the competitive instinct;* instrument for testing the force and direction of movement simultaneously.* (6) An aviary, an incubator and brooder, quarters for small animals, artificial nests for ants, etc., and other facilities for the study of comparative psychology.

The workshop of the psychological laboratory is equipped with two photographic dark-rooms, an electric motor, a Reed lathe with screw-cutting and gear-cutting attachments, and the necessary tools for work in wood and metal; it is used both for repairing old and for constructing new apparatus.

In addition to the apparatus in experimental psychology, the Department possesses a laboratory for the study of neurology. This includes a large number of charts, a series of models of the nervous system, including Auzoux models of brain, eye, and ear: Ziegler models of the embryology of the human brain; a series of human and animal brains; dissecting outfits; microtomes, microscopes, and other appliances necessary to the study of the structure and functions of the nervous system,

^{*}Designed and made in the Department.

COURSES FOR UNDERGRADUATES

- 1. Elementary Psychology. 6 hours.
- 1a. Introduction to Psychology. 3 hours.
- 4a. Experimental Psychology. 9 hours.
- 9. Psychology of Religion. 3 hours.
- 16. Abnormal Psychology. 6 hours.
- 3. Ethics: Lectures. 4 hours.
- 2. Logie. 3 hours.
- 27. Introduction to Philosophy. 2 hours.
- 6a. History of Philosophy: Ancient and Mediæval. 9 hours.
- 6b. History of Philosophy: Modern. 9 hours.
- 25. Advanced Ethics. 4 hours.

FOR GRADUATES AND UNDERGRADUATES

 Modern Idealism. An advanced study of metaphysics, based upon Royce's 'The World and the Individual' as a text. Professor Fite.

Fall, Winter, and Spring terms, T. Th., at 10:00.

Open to students who have taken Courses 1, 2, and 3, or their equivalent.

30. Seminary in Philosophy. A course designed to aid advanced students in the investigation of philosophical problems. The subject for 1908-09 will be problems of contemporary philosophy. Professor Lindley.

Fall, Winter, and Spring terms, two hours a week.

Open to students who have had sufficient preparation.

COURSE FOR GRADUATES

Psychological Research. Work arranged with individual students. Professor Lindley.

Fall, Winter, and Spring terms, at hours to be arranged.

DEPARTMENT OF EDUCATION

*John A. Bergström, Professor of Education and Director of the Psychological Laboratory.

ERNEST O. HOLLAND, Professor of Education.

W. H. SANDERS (Superintendent of the Bloomington Schools), Director of Practice in School Supervision and School Administration.

A major for the A.B. degree in Education requires forty-five credit hours.

Special programs of work for the M.A. and Ph.D. degrees will be recommended on application. In general the work of one student will differ somewhat from that of another, according to the practical career in view.

Brief descriptions of the Library, Laboratory, Museum, and other facilities for the study of Education and the professional training of teachers are published in a special bulletin, which is obtainable from the Registrar. This bulletin also contains a list of collateral courses in Biology, Psychology, Sociology, Philosophy, and History most likely to be of service to the graduate student in Education.

The work of the Department has also been adapted to meet the demand for professional, or pedagogical, training on the part of all classes of teachers established by recent school laws. The courses for this purpose are available for graduate students under the general regulations of the Graduate School. The Teacher's Certificate, usually given in connection with the A.B. degree to those who have completed the requisite academic and pedagogic training, may also be given on the same terms to such graduate students as may wish to secure it. The Depart-

^{*}Resigned

ment offers practice training in high school teaching, school supervision, and school administration.

For several years the best work of students in courses 4 and 5 has been published under the head of "Contributions from the Pedagogical Seminary of Indiana University." During the present year papers of this series have appeared in Education, Boston; the Educator Journal, Indianapolis; the Elementary School Teacher, Chicago: and in the Teacher's Journal, Marion.

COURSES FOR UNDERGRADUATES

- 1. Elementary Pedagogy. 15 hours.
- 16 a, b, c, d, e, f, The teaching of different subjects in elementary schools. Introductory course. (Summer School.) 15 hours,
- 17 a, b, c, d, e, f, The teaching of different subjects in elementary schools. Advanced course. (Summer School). 20 to 30 hours.
 - 6. High School Pedagogy. 6 hours.
 - 2. Educational Psychology. 5 hours.
- 13. Teaching of Special Subjects. Given by the different liberal arts departments. A dozen or more courses. Generally 2 hours each.
- 10. Observation of High School Teaching. 3 hours.
- Practice Teaching in the High School. In five different departments. 5 hours each.

COURSES FOR GRADUATES AND UNDERGRADUATES

[2. History of Education. The study of some of the chief educational classics and original sources, together with a connected survey of the chief conditions of education from ancient to modern times. (1) Fall term: Education in Greece, Rome, Alexandria, and the East (especially among the Hebrews). (2) Winter term: The early Christian schools, the reforms of Charlemagne, the rise of universities, the renaissance.

(3) Spring term: The work of the great modern reformers of education. Lectures and recitations. Professor Bergström.

Fall, Winter, and Spring terms. M. W. F., at 8:00.

Monroe, 'Source Book of the History of Education'; selected educational classics.

Omitted in 1908-09. Given every third year.

13. Modern School Systems. A comparative study of present day education, more especially in the United States, England, Germany, France, and Scandinavia; Education in Indiana. The policy of organization, ideals of work, methods of instruction, training of teachers, courses of study, statistics, and recent reforms. Lectures and recitations. Professor Bergström.

Fall, Winter, and Spring terms, M. W. F., at 8:00.] Omitted in 1908-09. Given every third year.

7. School Hygiene. School hygienic standards, and their application to school architecture, ventilation, heating, lighting, and sanitation. Hygiene of instruction, including the consideration of habits of study and teaching, and hygienic aspects of various subjects and of the curriculum as a whole. Demonstration of methods and instruments used in practical tests and in research. A preliminary treatment of parts of the subject has been given in the required course in Hygiene and in Education 6; it may be continued beyond Course 7 by investigation in Courses 4 and 5. Professor Bergström.

Fall term, M. W. F., at 8:00.

8. History and Science of Methods. Historical survey of the arts of teaching and study. History of theories of mental activity and development, and the corresponding theories of general method. Dependence of methods upon progress in culture, especially upon advances in different subjects. Present day methods and their modification through evolutionary pedagogy. A preliminary treatment of parts of the subject has been given in several preceding courses; it may be continued beyond Course 8 by investigations in Courses 4 and 5. Professor Bergström.

Winter term, M. W. F., at 8:00.

9. Courses of Study. Evolution of courses of study; comparison of courses in different countries, especially in elementary and secondary schools; theories as to the selection, gradation, and correlation of subjects; text-books; adaptation to various social conditions and to differences in the abilities of pupils; gradation, promotion, election; department teaching and special schools. A preliminary treatment of parts of the subject has been given in several preceding courses; it may be continued beyond Course 9 by investigations in Courses 4 and 5. Professor Bergström.

Spring term, M. W. F., at 8:00.

 Supervision Practice. Practice chiefly in the schools of Bloomington in the various duties of supervision, especially criticism of courses, teaching, tests, promotions, and hygienic conditions. Supt. W. H. Sanders.

Winter term, twice a week, at an hour to be appointed. Open to students who have taken at least a minor in Education.

 Administration Practice. Care and construction of buildings, appointment of teachers, management of school funds, duties of school boards and school officers, school law. Supt. W. H. SANDERS.

Spring term, twice a week, at an hour to be appointed. Open to students who have taken at least a minor in Education.

4. Pedagogical Seminary. Members meet once a week for the discussion of a general topic announced at the beginning of each term. For 1907-08 the topic was evolutionary pedagogy. In addition, lectures are prepared upon certain aspects of the topic. Credit of from two to five hours. Professor Bergström.

Fall, Winter, and Spring terms, Th., at 1:00.

COURSES FOR GRADUATES

5. Research in the Psychological Laboratory, the Library, or the Schools. In the laboratory several investigations will be in progress in which students may serve an apprenticeship; problems may then be taken up independently. The amount of work and the time and place for doing it will be arranged on consultation. Professor Bergström.

Fall, Winter, and Spring terms, at hours to be arranged.

DEPARTMENT OF FINE ARTS

Alfred M. Brooks, Professor. Robert E. Burke, Instructor.

There is a good equipment for graduate work in this Department. It is in the form of photographs and original engravings, together with the books in the Library.

COURSES FOR UNDERGRADUATES

- Principles of Delineation, Color, and Chiaroscuro, and the History of Painting. 6 hours.
- 2. History of Ancient Architecture. 5 hours.
- 3. History of Mediæval Architecture. 5 hours.
- 4. The Fine Arts of the Renaissance. 3 hours.
- 5. History of Architecture. 2 hours.
- 6. Engraving and Etching. 2 hours.
- Dante. Lectures on "The New Life" and "The Divine Comedy".
 6 hours.
- 8. Italian Painting.
- 9. Mediæval Art. 2 hours.
- 10. Landscape Painting.
- Elementary Mechanical Drawing. 6 hours.
 Fall, Winter, and Spring terms, T. Th., 10:00 to 11:50.
- 12. Freehand Drawing. Figure Sketching. 3 hours.
- 13. Freehand Drawing: Perspective. 3 hours.
- 14. Composition and Designing. 3 hours.
- 15. Water-Color. 6 hours.

DEPARTMENT OF MATHEMATICS

ROBERT J. ALEY, Professor.

SCHUYLER C. DAVISSON, Professor.

DAVID A. ROTHROCK, Professor.

ULYSSES S. HANNA, Assistant Professor.

CHARLES HASEMAN, Assistant Professor.

Undergraduates taking the work of this Department as major subject are required to complete Courses 2, 3, 6, 7, 11, 10, 13, 21, in the order named. They may elect as part of their collateral work Courses 17 and 36.

The graduate courses at present offered in the Department require about three years for their completion.

The Library of the Department of Mathematics, consisting of about 1,900 bound volumes, is located in Room 36, Wylie Hall. The Library is open from 8:00 a.m. to 10:00 p.m. for use by students pursuing advanced work in mathematics. The collection of mathematical books consists of the more important English, French, and German texts, the collected works of Abel, Bernoulli, Cauchy, Cayley, Clifford, DeMorgan, Gauss, Jacobi, Lagrange, Lie, Möbius, Riemann, Schwartz, Smith, Steiner, and Weierstrass, together with the following sets of periodicals:

Acta Mathematica. Stockholm, Berlin, Paris. 1882 to date. American Journal of Mathematics. Baltimore. 1878 to date. American Mathematical Monthly. Springfield, Mo. 1894 to date. Analyst (The). Des Moines, Ia. 1874-1883. Complete.

Annals of Mathematics. Charlottesville, Va., and Cambridge, Mass. 1884 to date.

Archiv für Mathematik und Physik. Leipzig. 1841 to date. Bulletin de la Société Mathématique de France. Paris. 1873 to date.

Bulletin of the American Mathematical Society. New York. 1894 to date.

Bulletin of the New York Mathematical Society. New York. 1891-1894. Complete.

Cambridge Mathematical Journal, Cambridge, 1837-1845. Complete,

Cambridge and Dublin Mathematical Journal. Cambridge, 1846-1854. Complete.

Educational Times (Mathematical Reprints from the). London. 1863 to date.

Jahresbericht der deutschen Mathematiker Vereinigung. Leipzig. 1890 to date.

Jahrbuch über die Fortschritte der Mathematik. Berlin. 1868 to date.

Journal de Mathématiques pures et appliqués (Lionville). Paris. 1836 to date.

Journal für die reine und angewandte Mathematik (Cre'lle). Berlin, 1826 to date.

Mathematical Monthly (The). Cambridge, Mass. 1859-1861. Complete.

Mathematical Magazine. Washington. 1882-1884.

Mathematical Gazette. London. 1901 to date.

Mathematical Messenger (The). 1887-1894. Complete.

Mathematical Review. Worcester. 1896-1897. Complete.

Mathematical Visitor. 1877-1883. Complete.

Mathematische Annalen. Leipzig. 1869 to date.

Mathesis. Ghent. 1881 to date.

Messenger of Mathematics (The Oxford, Cambridge and Dublin). Cambridge. 1862-1871. Complete.

Messenger of Mathematics (The). London and Cambridge. 1872 to date.

Nachrichten von der Königlische Gesellschaft der Wissenschaften zu Göttingen. Göttingen. 1899 to date.

Proceedings of the Edinburgh Mathematical Society. Edinburgh, 1883 to date.

Proceedings of the London Mathematical Society. London. 1865 to date.

Quarterly Journal of Mathematics, Pure and Applied. London. 1857 to date.

Rendiconti del Circolo Matematico di Palermo. Palermo. 1884 to date,

Revue Semestrielle des Publications Mathématiques. Amsterdam. 1893 to date.

Transactions of the American Mathematical Society. New York, 1900 to date.

The Euclidian Circle is an organization made up of members of the mathematical faculty, graduate students, Seniors, Juniors, and Sophomores. Meetings are held on the second and fourth Mondays of each month at 7:00 p.m. The programs consist of essays, reports, and discussions by the members.

COURSES FOR UNDERGRADUATES

- 2. Algebra. 5 hours.
- 3. Trigonometry. 5 hours.
- 6. Analytical Geometry. 5 hours.
- 7. Elementary Calculus. 9 hours.
- 11. Solid Analytical Geometry. 2 hours.
- 10. Advanced Calculus. 9 hours.
- 13. Differential Equations. 6 hours.
- 21. Theory of Functions of a Complex Variable. 6 hours.
- 7. Surveying. 2 hours.
- 36. Descriptive Geometry. 9 hours.

COURSES FOR GRADUATES

The following courses for graduate students will be given at hours to be arranged:

- 20. Mathematical Reading and Research. Professors ALEY, DAVISSON, and ROTHROCK.
- Higher Algebra. A course in modern advanced methods of algebraic analysis. Four hours' credit. Professor Alex.

- 47. Quaternions. An introductory course with applications to geometry and mechanics. Three hours' credit. Professor Rothrock.
- 23. Algebra of Quantics. A study of quantics with especial reference to invariants, covariants and canonical forms. Four hours' credit. Professor Alex,
- 32. Theory of Numbers. In this course the elementary properties of numbers are studied. Emphasis is given to the general theory of congruences. Four hours' credit. Professor ALEY.
- 22. Modern Pure Geometry. A course of lectures, assigned readings and selected exercises upon the geometry of the triangle and circle. Three hours' credit. Professor Alex.
- 15. Modern Analytical Geometry. A study of point and line coordinates, duality, anharmonic ratios, nature of co-ordinate systems, circular points, and the line at infinity. Lectures, assigned reading, and exercises. Four hours' credit. Professor DAVISSON.
- 30. Theory of Surfaces. Lectures and reports upon the general theory of surfaces and twisted curves. Singularities of surfaces, asymptotic curves, lines of curvature, geodesic lines. Differential geometry. Four hours' credit. Professor Davisson.
- 44. Non-Euclidean Geometry. Lectures and assigned reading. Four hours' credit. Professor Davisson.
- 38. Fourier's Series and Fourier's Integrals. A study of the more important partial differential equations of mathematical physics, the development of functions into sine and cosine series Fourier's series and Fourier's integrals, and applications of the latter two in the solution of problems in physics. Three hours' credit. Professor Davisson.
- 33. Partial Differential Equations. A course based on Weber's 'Partielle Differential-Gleichungen'. Six hours. Professor ROTHROCK.

- 45. Calculus of Variations. Six hours' credit. Professor Rothrock.
- Bessel, Laplace, and Lamé Functions. A study of functions defined by differential equations. Applications. Four hours' credit. Professor ROTHROCK.
- 46. Potential Functions. Four hours' credit. Dr. HASEMAN.
- 48. Mathematical Theory of Elasticity. This course is based on Love's 'Treatise on the Theory of Elasticity'. Six hours' credit. Dr. Haseman.
- Elliptic Integrals and Elliptic Functions. Discussion of elliptic integrals of the three kinds; addition theorems, Jacobi's geometrical proof of addition theorem; Landen's transformation; application. Four hours' credit. Assistant Professor Hanna.
- 25. Infinite Series and Products, Expansion of functions into infinite series and products; limitations of series; determination of the convergence or divergence of given series. Four hours' credit. Assistant Professor Hanna.
- 14. History of Mathematics. A detailed study of the history and development of mathematics by means of lectures, assigned readings, and reports. Six hours' credit. Professor ALEY.

DEPARTMENT OF MECHANICS AND ASTRONOMY

WILBUR A. COGSHALL, Associate Professor of Astronomy. Vernon A. Suydam, Instructor in Mechanics,

Candidates for the degree A.B. in Mechanics and Astronomy are required to take three full years of daily work in this Department (45 hours), and the work of one full year in the Department of Physics. In addition the students are recommended to take Mathematics 7, 10, and 11; Geology 1 and 1a; and enough French and German to acquire a reading knowledge of these languages.

Kirkwood Observatory, completed in 1900, is occupied by the Department. The building contains a library and computing room; a lecture room; dark room; a transit room, in which is a Bamberg universal instrument, a Howard sideral clock, a mean time chronometer, and a chronograph; a dome twenty-six feet in diameter; and a room of the same size immediately below. In the dome is the refracting telescope, of which the 12-inch objective is by Brashear, and the mounting by Warner and Swasey, of Cleveland: The instrument has a focal length of about 15 feet, and is supplied with eyepieces magnifying from 130 to nearly 1,000 diameters; also with polarizing helioscope, diagonal eyepiece, and an electrically illuminated micrometer; there are both coarse and fine circles in right ascension and declination, the fine circles having reading microscope and electrical illumination.

The Department has in a separate building, a mounting, designed and built by the Department, that carries a 4-inch Browning refractor, a 5-inch portrait lens and an 8-inch parabolic mirror, for the photography of comets, nebulæ, etc.

Another building contains a colostat and horizontal telescope. The objective of the telescope has a diameter of 9 inches and a focal length of 64 feet. Both the plane of the colostat and the lens are by Petitdidier, of Chicago.

The Lawrence Fellowship of the Department of Mechanics and Astronomy of Indiana University has been established by Mr. Percival Lowell, of the Lowell Observatory, upon the following terms and conditions:

1. The Fellowship shall be known as the Lawrence Fellowship, in remembrance of the donor's mother, and is established in perpetuity, revocable, however, at any time at the will of the founder.

- 2. It shall be annually available and shall cover the college calendar year, that is from commencement to commencement of the same.
- 3. The applicant shall be appointed by the Department, the donor reserving the right of final passing upon the suitability of the candidate so presented.
- 4. (A) The Fellow shall be given time and opportunity for an original thesis on some astronomical subject looking to the taking of a Master's degree, the nature of which shall be decided by the Director and the Fellow. (B) But the Fellow shall be expected to give general assistance in the observatory's work during the period of his Fellowship.
- 5. The Fellowship shall pay \$600 and the Fellow's traveling expenses to and from the Observatory at Flagstaff, Ariz.; and a furnished room at the Observatory shall be free to the Fellow's use.

The Department receives telegraphic bulletins of discoveries made at American and European observatories.

COURSES FOR UNDERGRADUATES

- 1. Descriptive Astronomy. 6 hours.
- 2. Practical Astronomy. 5 hours.
- 3. Current Astronomy. 6 hours.
- 4. Observatory Practice. 6 hours.
- 5. Celestial Photography. 2 hours.
- 6. Elementary Mechanics. 5 hours.
- 7. Analytical Mechanics. 9 hours.
- 10. Hydraulics. 3 hours.
- 9. Graphic Statics. 6 hours.

COURSES FOR GRADUATES AND UNDERGRADUATES

 Theoretical Astronomy. Integration of equations of motion; computation of orbits and ephemerides. Associate Professor Cogshall.

Fall term. Hours and credit to be arranged with each student. Open to students who have passed in Mathematics 7.

13. Research. A limited number of students will be permitted to undertake research work under the supervision of the Department. The equipment is best suited for work in astronomy of precision and celestial photography. Associate Professor Cogshall.

Fall, Winter and Spring terms. Hours and credit arranged with each student.

 Orbits of Spectroscopic Binaries. A discussion of the methods of Rambault, Lehmann-Filhes, and others for the determination of these orbits. Associate Professor Cogshall. Winter term, T. Th., at 2:00.

15. Celestial Mechanics. An introductory course. Associate Professor Cogshall.

Spring term, M. W. F., at 11:00.

Open to students who have passed in Course 7.

 Theoretical Mechanics. Lectures and recitation from text-book. Geometry of motion; linear, plane and solid kinematics; kinetics of a particle and of free and rigid bodies; motion of a variable system. Mr. Suydam.

Fall and Winter terms, M. W. F., at 9:00.

Zeiwet, 'Theoretical Mechanics'.

8a. Rigid Dynamics. A course intended for students who have completed Mechanics 7 and 8. Discussion of laws of motion, work and energy, oscillations and cyclic motions, dynamics of rigid and deformable bodies, hydrodynamics. Mr. SUYDAM.

Fall term, T. Th., at hours to be arranged.

Webster, 'The Dynamics of Particles and of Rigid, Elastic and Fluid Bodies'.

Open to Seniors and graduates who have passed in Mathematics 11, 10, and 13.

DEPARTMENT OF PHYSICS

ARTHUR L. FOLEY, Professor of Physics.
ROLLA R. RAMSEY, Associate Professor of Physics.

Undergraduates electing Physics as their major subject are required to complete Courses 1 and 2, and either 6, 19, 11, 20 and 5, or 17, 23, 27, 29, 11 and 20. Substitutions will not, as a rule, be permitted, although the order of the courses may be changed and a greater number of courses may be taken simultaneously, thus shortening the time required to complete the work. Courses 6 and 7 in Mathematics should be taken as early as possible.

The Department offers a full course leading to the degree of Ph.D.

A Physics Club, consisting of the instructors and of advanced students of the Department, meets on alternate Thursdays at 7:00 p.m. At each meeting one or two reports are presented upon the more important recent scientific investigations, and upon subjects in physics that are not considered in the class-room.

The Department is located in Science Hall. The lower half of this building was planned to meet the special needs of the Department, and it embodies the most advanced ideas in physical laboratory construction. The location of the building insures freedom from vibration; the construction is massive and thoroughly fireproof. On the basement floor there are a constant temperature room, a large dynamo laboratory, a manual training laboratory, a drawing room, two research laboratories and two storerooms. The first floor is occupied by the office of the Department, the departmental library, a shop room, an apparatus room, an advanced electrical laboratory, two photometric laboratories, a spectroscopic and photographic laboratory, a standardizing laboratory, a chemical and

battery room, a laboratory for advanced work in heat, two research laboratories, five developing rooms, and the elementary laboratories. The latter comprise five rooms—a large room devoted to general practice, and four small rooms for work in sound and light. The south wing of the second floor contains the lecture room, an apparatus and preparation room, and a class room. The lecture room has an elevated floor and is seated with tablet-arm opera chairs. It is provided with automatic blinds, screens, and boards, all under the immediate control of the lecturer. The lecture table is built in three sections, and the plumbing and wiring are arranged so that one, two, or three sections may be used at a time. At the table the lecturer has battery and dynamo currents (direct and alternating,—one, two, and three phase), dial rheostats, voltmeters, ammeters, electric motors, calcium and electric lanterns, projectoscope, low and high resistance projecting galvanometers, water, gas, compressed air, exhaust cocks, etc. All the laboratories are supplied with water, gas, and electricity. The basement floors are of concrete. There are fifteen large masonry piers and more than three hundred lineal feet of six-inch stone wall shelves. The chemical and battery room has a fume hood and a cement floor. All the developing rooms have both gas and electric ruby lights, tile shelves, and lockers. Thirteen rooms are provided with blinds for making them light tight. The smaller shop room contains a cabinet-maker's bench, a wood trimmer, two screw-cutting lathes, a shaper, a grinder, and wood and metal working tools. This shop is for the repair and construction of physical apparatus. The larger shop is equipped with cabinet-maker's benches, power saws, grinders, wood and metal working lathes, forges, and the tools required for the shop work outlined

under Courses 17, 27, 28, and 29. The dynamo room in Science Hall is equipped with generators and motors of eight different types, selected to illustrate the essential features of early as well as modern practice. The generators are belted to a line shaft driven by a Lincoln variable speed motor with speed range of one to five. A traveling crane permits the lifting of any machine in position to be connected by a torsion dynamometer to any other machine, and the machines studied both as generators and motors. All the machines are of special construction, the field and armature windings being divided into sections and the terminals brought to separate posts, thus permitting the study of the performance of the machines under widely different conditions. Direct current may be had of any voltage up to eight hundred, and alternating current (one, two, or three phase), of any frequency from ten to three hundred, and of any voltage (without transformers) up to six hundred. The voltage range is still further increased by transformers of various sizes having both primary and secondary coils in three sections with separate terminals for each section. A large dynamo laboratory is provided in a separate building. It is equipped with three single engines, one of ten, one of forty, and one of one hundred fifty horsepower, one compound engine of one hundred twenty-five horsepower, and four generators, respectively of twenty, twenty, eighty, and one hundred kilowatts capacity. The laboratory is well equipped with voltmeters, ammeters, wattmeters, dynamometers, rheostats, and other instruments for heavy currents; also with delicate instruments for exact measurements.

The supply of apparatus for the presentation of courses in modern experimental physics is fairly com-

plete. The equipment and facilities for work have been largely increased during the past three years, especially in the way of delicate instruments and accurate standards for advanced study.

The Library of the Department of Physics contains about six hundred volumes, exclusive of sets of several journals. The following magazines are on file: 'Annalen der Physik', 'Annales de Chemie et de Physique', 'Beiblätter zu den Annalen der Physik', 'Physikalische Zeitschrift', 'The Electrical World and Engineer', 'The Electrician' (London), 'Journal de Physique', 'The Philosophical Magazine', 'The Physical Review', 'The Proceedings of the Physical Society of London', 'The Proceedings of the Royal Society', 'Le Radium', 'School Science and Mathematics', 'Science Abstracts' (A and B), 'Scientific American and Supplement', 'The Western Electrician', 'Cassier's Magazine', and 'The Manual Training Magazine'. Students have access also to the journals on file in the general library, and in the libraries of other Departments. Of these may be named: 'The American Journal of Science', 'The Astrophysical Journal', 'The Engineering and Mining Journal', 'The Engineering Magazine', 'Nature', 'Comptes Rendus', and 'Science'.

COURSES FOR UNDERGRADUATES

- 1. General Physics. 9 hours.
- 2. Laboratory Practice. 6 hours.
- 3. Advanced Laboratory Work. 6 hours.
- 4a. Heat Lectures. 3 hours.
- 4b. Heat. Advanced Laboratory Work. 2 hours.
- 6a. Light. Lectures. 3 hours.
- 6b, Light. Advanced Laboratory Work. 2 hours.

- 19. Physical Problems.
- 11. Practical Photography.
- 20. Physical Methods and the Manipulation of Physical Apparatus,

 1 hour.
 - 5a. Theoretical and Experimental Electricity. 6 hours.
- 5b. Electricity. 9 hours.
- 10a. Applied Electricity and Dynamo-Electric Machinery. 9 hours.
- 10b. Applied Electricity and Dynamo-Electric Machinery. 9 hours.
- 23. Mechanical Drawing and Designing. 6 hours.
- 24. Polyphase Electric Currents. 3 hours.
- 26. Engineering Laboratory Practice. 1 hour.
- 25. Thermodynamics. 2 hours.
- 17. Shop Work. 6 hours.
- 27. Wood Working, Turning, and Pattern Making. 4 hours.
- 29. Machine Shop Work. 9 hours.

COURSES FOR GRADUATES AND UNDERGRADUATES

- 12. Theory of Light. Lectures and recitations. Associate Professor Ramsey.
 - Fall, Winter, and Spring terms, T. Th., at 9:00. Preston, 'Theory of Light.'
- 16b. Laboratory Practice in Spectroscopy and Photometry. Professor Foley and Associate Professor RAMSEY.
 Fall, Winter, and Spring terms, T. Th., at 2:00.
- Advanced Laboratory Methods and Research. Professor Foley.
 Fall, Winter, and Spring terms, daily, at 1:00.
- Current Physical Literature. Professor Foley.
 Fall, Winter, and Spring terms, T. Th., at 11:00.
- Advanced Theoretical Physics. A critical study of standard treatises and memoirs. Professor Foley.
 Fall, Winter, and Spring terms, T. Th., at 10:00.

DEPARTMENT OF GEOLOGY

EDGAR R. CUMINGS, Associate Professor. Joshua W. Beede, Assistant Professor.

[An act of the State Legislature, in force since September 7, 1861, provides that "The State Geologist, while he holds his office, shall be regarded as a member of the Faculty of the University, and he is hereby directed in his reconnoissances to collect duplicate specimens of mineralogy and geology, and to deposit one set of the same in the cabinet of the State University". The present incumbent of the office is Hon. WILLIS STANLEY BLATCHLEY, A.B., Indiana University, 1887; A.M., 1891.]

Candidates for graduation in this Department are required to do three full years of daily work in Geology, and in addition Zoölogy 1, Astronomy 1, and Chemistry 1. A certain portion of the work in Geology must represent investigation of some problem in the field. An opportunity is given the student to carry on such work during the summer vacation.

The Department also offers courses leading to the Ph.D. degree. The Department is provided with the following laboratories: (1) A geological laboratory and lecture room, used for general geology, and geography; (2) a mineralogical laboratory, which will accommodate twenty students; (3) an elementary paleontological laboratory, which will accommodate about six students; (4) two research laboratories; (5) a large museum room devoted to the study and installation of collections.

In the course in Mineralogy each student is provided with all the necessary apparatus for the determination of the common ores and rock-making minerals. The collections used in the course in elementary Mineralogy include about two hundred and twenty-five species. The crystallographic collections contain about two hundred and fifty

wooden and plaster models, Howell's celluloid models, and a carefully selected collection of minerals illustrating characteristic crystal forms.

The facilities for geographical study have been much enlarged by the addition to the laboratory equipment of a large series of maps, charts, lantern slides, models, etc. The map collections furnish part of the necessary material for advanced geographical courses.

The Department is in possession of an extensive collection of fossils, including a type collection of invertebrates arranged in biological sequence, and a historical collection representing the characteristic life forms of the several geological epochs, as well as very large collections representing the Indiana formations. The latter include much unworked material, especially rich in the young stages of Brachiopoda and Bryozoa, which could serve as the basis of investigations in paleontological lines. The Department also possesses about 3,000 thin sections of fossils, mostly Bryozoa; and has all the facilities—rock slicer, grinding plates, etc.—for making sections.

The work of the Department for the Summer term consists in a detailed study of the field relations of some one of the geological formations of Indiana. For the present the Ordovician or Mississippian will be made the object of investigation. This work involves the determination of the areal, topographical and stratigraphical relations of the formation and its subdivisions, together with the collection of fossils and the accurate delimitation of faunal zones. Students electing this work must have completed Courses 1, 1a. and 4. Credit will be given for the work in proportion to the actual time spent in the field.

Work of this sort, but more advanced in character,

may also be pursued by students who are candidates for an advanced degree. The State of Indiana affords many geological and geographical problems suited to form the basis for a thesis for the doctor's degree.

The Department receives the following periodicals: 'Geological Magazine', 'Quarterly Journal of the Geological Society of London', 'Zeitschrift der deutschen geologischen Gesellschaft', 'Neues Jahrbuch für Geologie, Mineralogie und Paleontologie', 'Geologiches Centralblatt', 'Geographisches Zeitschrift', 'Bulletin de la Societé Geologique de France', 'Annales de Geographie', 'Annales de Paleontologie', 'Engineering and Mining Journal', 'School of Mines Quarterly', 'Journal of Geology', 'Economic Geology', 'Transactions of the St. Louis Academy of Science', 'Journal of the Cincinnati Society of Natural History', 'Bulletins of the Geological Society of America', 'Bulletin of the Geological Department of the University of California', 'Monthly Weather Review.'

COURSES FOR UNDERGRADUATES

- 1, 1a and 4. General Geology (Dynamical, Structural, and Historical). 15 hours.
- 2. Mineralogy. 5 hours.
- 6. Physical Geography. 10 hours.
- 12. Advanced Physical Geography. 5 hours.
 - 8. Field Geology. 10 hours.
 - 3. Economic Geology. 5 hours.
- 13. Advanced Field Work. 5 to 15 hours.

COURSES FOR GRADUATES AND UNDERGRADUATES

 Economic Geology. Lectures, laboratory and field work on the geological relations, geographical distribution, and uses of the more common building stones, clays, cements, coals, oil and gas, and ores. Fully illustrated by lantern slides. The preparation of reports on assigned topics is required. Assistant Professor BEEDE.

Winter term, daily, at 2:00.

This course may also be elected by Seniors in Geology or Chemistry.

5. Systematic Paleontology. The general principles of the subject are taught by means of occasional lectures, supplemented by a study of the general literature of paleontology. Training in the systematic study of fossils is given by means of careful determination in the laboratory of typical groups of Paleozoic invertebrates. Associate Professor Cumings and Assistant Professor Beede.

Fall, Winter, and Spring terms, two to five hours, at times to be arranged.

Open to students who have passed in Zoölogy 1, and Geology 1, 1a, and 4

5a. Evolution. Study of the principles of organic evolution as illustrated by fossil organisms. Associate Professor Cumings.

Winter term, at an hour to be arranged.

Open to graduate students only.

10. Research. Investigation of geological and paleontological problems. The results obtained, when of sufficient merit, will be published as 'Contributions from the Geological Laboratory of Indiana University'. Associate Professor Cum-

Fall, Winter, and Spring terms, daily, 9:00 to 4:50.

13. Advanced Field Work. This work is described in the general announcement above. It consists of continuous work in the field for a month or more during the Summer vacation. It will usually be taken up as part of a research problem by candidates for the A.B. degree in geology, or by candidates for an advanced degree.

Open only to advanced students in Geology.

14. Stratigraphic Geology. A thorough study of the literature of the various geologic systems. The history of their investigation and the present knowledge of their divisions, distribution, faunas and paleogeography will be considered. Associate Professor Cumings and Assistant Professor Beede.

Fall, Winter and Spring terms. Lectures Tuesday and Thursday, at 10:00.

DEPARTMENT OF CHEMISTRY

Robert E. Lyons, Professor.
Louis S. Davis, Professor.
Oliver W. Brown, Associate Professor.
Frank C. Mathers, Assistant Professor.
*Clarence E. May, Assistant Professor.

The Department of Chemistry has general, special, and private laboratories, a library room, a lecture room, balance rooms, an incubator room, a stock room, museum, etc. Special laboratories are provided for electrochemistry, assaying and electric furnace work, organic, inorganic and physiological chemistry, water and gas analysis, spectroscopic analysis. The laboratories comprise eleven large, well-lighted rooms, equipped with workstands, capable of accommodating two hundred and seventy-five students. Each room is provided with fume hoods and air registers connected with a ventilating fan for the removal of offensive and poisonous gases.

The general equipment for graduate work, including laboratory and library facilities, has been materially increased during the past year. A laboratory for electrometallurgy has been installed and fully equipped.

Special attention is given to inorganic, organic, physiological, physical and electro-chemistry, technical analytical chemistry, and electrometallurgy.

^{*}From August 1, 1908.

The graduate work of the Department, leading to the degrees A.M. and Ph.D., comprises advanced laboratory, lecture, library and seminary work in the lines indicated above, and special graduate courses described below. A thesis embodying original investigation is required for an advanced degree.

Graduate students should have a reading knowledge of German and French.

COURSES FOR UNDERGRADUATES

Courses 1 (or 1a), 3^1 , 3^2 , 4, 5, 6^1 , 6^2 , 7, 18^1 , 18^2 , and 30^1 , 30^2 , 30^3 , or the equivalent, are required for admission to the graduate courses in Chemistry.

1 or 1a, General Chemistry. 5 hours.

- 3. Qualitative Analysis. 10 hours.
- 4. Quantitative Analysis (Gravimetric). 5 hours.
- 5. Quantitative Analysis (Volumetric). 5 hours.
- 6. Organic Chemistry. 10 hours.
- 7. Organic Chemistry. 5 hours.
- 18. Physical Chemistry. 4 hours.
- 30. Advanced Inorganic. 6 hours.

COURSES FOR GRADUATES AND UNDERGRADUATES

- Seminary. Reports on current literature and special topics.
 (1) Fall term: Inorganic Chemistry. Assistant Professor Matuers.
 (2) Winter term: Organic Chemistry. Professor I.YONS.
 (3) Spring term: Electro- and Industrial Chemistry. Associate Professor Brown.
 - Fall, Winter, and Spring terms, Th., at 7:00 p.m.
- Physical Chemistry. Laboratory work in physico-chemical measurements supplementary to the lectures. Includes calibration of instruments, determination of molecular weights,

thermo-chemical measurements, a study of the properties of solutions, the speed of chemical reactions, etc. Research work. Associate Professor Brown.

Fall, Winter, and Spring terms, at hours to be arranged. Ostwald-Luther, 'Physiko-chemische Messungen'.

22. Electrochemistry. (A) Lectures on the general theory and laws of electrochemistry, and the principles and methods employed in the electrodeposition of metals for quantitative analysis, plating, separating, and refining. (B) Laboratory work in quantitative electrolytic analysis, electrochemical measurements and electroplating. Associate Professor Brown.

Winter term. Lectures T. Th., at 8:00; laboratory work, M. W. F., 1:00 to 4:50.

Lehfelt, 'Electrochemistry'; Classen, 'Quantitative Electrolytic Analysis'; Pfanhauser, 'Elektroplattirung'.

Presupposes Chemistry 1 and 3, and Physics 1 and 2.

23. Electrochemistry. (A) Lectures. Electrolysis and electro-synthesis of inorganic and organic compounds, primary and secondary batteries, and a study of the various electrochemical and electro-metallurgical processes which are of commercial importance. (B) Laboratory work in the preparation of inorganic and organic compounds by electrolytic and electrothermal methods, and in testing primary and storage batteries. Associate Professor Brown.

Spring term. Lectures T. Th., at 8:00; laboratory work, M. W. F., 1:00 to 4:50.

Elbs, 'Electrolytic Preparations'; Borchers, 'Electric Smelting and Refining'.

24. Advanced Electrochemistry and Electro-metallurgy. (A) Advanced laboratory work and research in pure and applied electrochemistry and electro-metallurgy, including investigations in electric furnace work, refining and extraction of metals, electro-synthesis of organic and inorganic compounds, manufacture of storage batteries, and of industrial electrochemical processes. (B) Lectures on the design and operation of commercial electric furnaces and on electric furnace processes and products. Associate Professor Brown.

Fall, Winter, and Spring terms. Laboratory work, daily, 8:00 to 4:50; lectures, Winter term, F., at 8:00.

Students in this course are recommended to take Physics 10 and 24.

26. Chemical Engineering. Machinery, appliances and materials of construction in the chemical industries. Laws and principles involved in the operation of chemical processes on an industrial scale. Associate Professor Brown.

Fall term. Lectures, M. W., at 8:00.

Davis, 'Chemical Engineering'.

29. Storage Batteries. (A) Lectures and recitations on the theory, operation, testing and design of storage batteries. (B) Laboratory work in the testing and building of storage batteries. Associate Professor Brown.

Spring term, 1909. Lectures F., at 8:00; laboratory work, one or more periods a week.

Dolezalek, 'Theory of the Lead Accumulator'; Lyndon, 'Storage Battery Engineering'.

For advanced work in the manufacture of storage batteries see Chemistry 24.

13. Elementary Metallurgy and Assaying. The course is given in alternate years. (A) Laboratory work. The fire assay of gold, silver, and lead ores. (B) Lectures on assaying and on elementary metallurgy, including a discussion of typical metallurgical processes. Associate Professor Brown.

Fall term, 1908-09. Lectures, T. Th., at 8:00; laboratory work, F. S., 8:00 to 11:50.

Brown, 'Manual of Assaying'; Robert-Austen, 'Introduction to the Study of Metallurgy'.

Presupposes Geology 2 and Chemistry 5.

12. Advanced Laboratory and Research Work in Organic or Physiological Chemistry. Following are the problems studied in 1907-08: Substituted oxy-acetyl derivatives of urea and thiourea; thio-carbonyl salicylamide and derivatives; an investigation of thirty samples of Indiana peat. Professor Lyons. Fall, Winter, and Spring terms, daily, 8:00 to 4:50.

15. Quantitative Analysis. Advanced laboratory practice in technical and engineering analysis. The work is selected to meet the particular need of the student and as a preparation for actual work in commercial laboratories in the following lines: Iron ores, pig iron and steel; clay, limestone, rock and cement; soaps, fertilizers, soils, and foods; oils, varnishes and paints; testing of chemical reagents and water for industrial use: alloys, ores of copper, zinc, lead, tungsten, vanadium, manganese. The use of the microscope, spectroscope, and refractometer in the examination of certain commercial products, foods, and beverages. Assistant Professor Mathers.

Spring term, daily, 8:00 to 4:50. Students will be received at any time during the term.

Fresenius, 'System of Quantitative Analysis'; Sutton, 'Volumetric Analysis'; Stillman, 'Engineering Chemistry'; Ulzer and Fraenkel, 'Techno-Chemical Analysis'; Classen, 'Quantitative Analysis'; Olsen, 'Quantitative Analysis'; collateral reading.

Presupposes Courses 1, 3, 4, and 5. This course is also open to special students.

31. Advanced Inorganic Chemistry. Laboratory work. The preparation and study of the properties and reactions of the different compounds of the rare and uncommon elements, followed by research. This includes a review of the literature relating to the element that is being studied. Assistant Professor MATHERS.

Fall, Winter, and Spring terms, M. W. F., 8:00 to 4:50.

32. Gas and Fuel Analysis. (A) Lectures and recitations. Theory of gas and fuel analysis, and a description of the apparatus used. Calculation and interpretation of data dealing with problems in gas and fuel testing. (B) Laboratory work. Use and manipulation of the apparatus used in commercial gas analysis. Analysis of mixtures of gases, air, illuminating gas, and producer gas. Approximate and ultimate analysis of coal. Heating evaluation of coke, coal, oil, and peat, by the Parr calorimeter. Three hour course. Assistant Professor Mathers.

Fall term, lectures T., at 1:00; laboratory work at hours to be arranged.

Hempel-Dennis, 'Gas Analysis'; Gill, 'Gas and Fuel Analysis for Engineers'.

33. Spectrum Analysis and Sugar Analysis. (A) Lectures and Recitations. Theory and description of apparatus used in spectrum analysis. Outlines of the characteristic spectra of the different elements as used in qualitative analysis. Description of apparatus and the methods used in sugar analysis. (B) Laboratory work. Use of a Kruess spectroscope in mapping the emission, spark and absorption spectra of certain elements. Qualitative analysis with the spectroscope of unknown samples and of certain commercial products and minerals. Analysis of sugar by the polariscope and by chemical means according to the methods used in commercial sugar laboratories. Assistant Professor Mathers.

Winter term, lectures, F., 1:00; laboratory work at hours to be arranged.

Watt's, 'Introduction to the Study of Spectrum Analysis'; Baly, 'Spectroscopy'; Rolfe, 'The Polariscope'.

25. Advanced Organic Chemistry, Lectures and Recitations.

Primarily for graduates:

Cohen, Advanced Organic Chemistry.

Fall term, T. and Th., at 9:00. Professor Lyons.

DEPARTMENT OF BOTANY

David M. Mottier, Professor. Frank M. Andrews, Associate Professor. James M. Van Hook, Assistant Professor.

Candidates for the degree of Bachelor of Arts in Botany are required to pursue a minimum of forty-five hours of work or its equivalent in the Department, together with one year's work in some other science. Students are urged to learn to read German books and papers on Botany.

The work immediately following the elementary course is largely advanced laboratory work; it is purely individual, and its methods are the same as in original investigation. The supplementary Course 8 may be taken in connection with any of the advanced work; it consists largely of lectures, and the subjects treated may vary from year to year. The latter part of the course is generally devoted to some line of study which may serve as an introduction to research. A few of the advanced courses are given in alternate years only.

Graduate work leading to the degree of Master of Arts in Botany comprises special studies along some line indicated in the advanced courses enumerated below, or the investigation of some problem of a more limited scope. For the degree of Doctor of Philosophy, the subject of the thesis is selected from some line of morphology, cytology, or physiology. A reading knowledge of German and French is assumed.

The Department occupies the second floor of Owen Hall, together with special laboratories in the basement and a small greenhouse. On the second floor are the three well-lighted general laboratories, the office and private laboratory, the departmental library, and the general storeroom. A dark room for photographic and experimental work, constant temperature and incubator rooms, and a winter storage and work room are in the basement. The west laboratory on the second floor is used also for the Department lecture room. It is provided with a Zeiss projection apparatus by which it is possible to project upon the screen various phenomena of plant life, living organisms of miscroscopic size, miscroscopic preparations of tissues and organs, as well as lantern slides and other transparencies.

The departmental library contains the more necessary works of reference and the principal botanical journals.

The research work in this Department during the past three or four years has been confined to studies in sporagenesis and spermatogenesis among higher plants.

COURSES FOR UNDERGRADUATES

- 1. Elementary Botany. 15 hours.
- 2. Histology. 5 hours.
- 9. Embryology of Angiosperms. 5 hours.
- 5. Physiology. 10 hours.
- 10. Ecology and Taxonomy. 5 hours.
- 11. Embryology of Gymnosperms. 5 hours.
- 12. Morphology of Bryophytes and Pteridophytes. 5 hours.
- 15. Morphology and Classification of the Flowering Plants. 5 hours.
- 17. Study of Trees. 5 hours.
- 14. Seminary. The work of the Seminary consists of reports on investigations carried out in the laboratory, reviews of current botanical literature, and the study of special works pertaining to botanical science. Professor MOTTIER.

Fall, Winter, and Spring terms, at an hour to be appointed.

COURSES FOR GRADUATES AND UNDERGRADUATES

4. Morphology of I'ungi. A study of the life-history of representatives of the great groups of fungi, supplemented by a systematic acquaintance with various genera of the local flora.

Lectures and laboratory work. Assistant Professor Van Hook.

Fall, Winter, and Spring terms, daily, 1:00 to 3:00.

- Cytology. Practical application of modern methods in a study of nuclear and cell-division. Professor MOTTIER.
 Fall, Winter, and Spring terms, daily.
- 8. The Cell in Sex and Heredity. Lectures on the evolution of sex in plants, the process of fecundation, and closely related phenomena. The introductory lectures deal with nuclear and

cell-division in the plant kingdom, frequent reference being made, for comparison, to karyokinesis in the animal cell. Professor MOTTER.

Fall term, T. Th., at 3:00. Given in alternate years.

13. Morphology of the Algae. A study of the life-history and of the development of vegetative and reproductive organs in representative algae. The work is confined very largely to fresh-water forms. Lectures and laboratory work. Professor MOTTIEE.

Fall term, daily, 1:30 to 5:00.

 Original Research. Problems for special investigation will be assigned to students who are prepared to undertake original work. Professor MOTTIER.

Fall, Winter, and Spring terms, daily.

Ability to read German and French is assumed.

 Investigations in Mycology and Plant Pathology. Assistant Professor Van Hook.

Fall, Winter, and Spring terms, daily, 1:00 to 3:00.

DEPARTMENT OF ZOÖLOGY

Carl II. Eigenmann, Professor and Director of the Biological Station.

CHARLES ZELENY, Associate Professor.

Undergraduates selecting Zoölogy as their major subject are required to complete 45 hours, of which two years' work (Courses 1, 2a, 2b, 2e), are alike for all students. The third year, Course 3, is devoted to the investigation of some limited topic and the preparation of a report. This course differs with each student; it is a research course. All students making Zoölogy their major subject are recommended to take Botany 1, Physiology, and Chemistry early in their course.

Full work leading to the degree Ph.D. is offered in

Course 6. It is purely a research course and offers the widest choice of subjects commensurate with the equipment of the Department.

The subjects selected have radiated from two centers. One of these is the problem or problems of the fresh water fauna of tropical America. At the present the Department is engaged in a study of divergent evolution as shown by the tropical American Characin fishes.

The Department is well equipped for this work. The most important of the zoölogical collections is the collection of fishes, comprising many thousand specimens. Arrangements have been made for cooperation with various other institutions by which the largest aggregation of collections of South American freshwater fishes in the world is available for a monograph in preparation. Mr. John Haseman, A.M., '07, of this University, is exploring the rivers between the La Plata and the San Francisco rivers for the Carnegie Museum of Pittsburg; and another expedition will try to reach the plateau of Guiana during the coming year. Collections have been received during the year from Central America, through the Field Museum of Chicago: from Brazil, through the British Museum, and especially through the Museu Paulista of Sao Paulo, Brazil. By special arrangement the collections of Harvard University, made by L. Agassiz and his assistants during the Thayer expedition, and by others, are available for a monograph on the American Characins. The first section of this is nearly ready for the printer.

The second center of departmental interest has been and is the subject of heredity, especially: (A) The history of the sex cells, (B) Variation, (C) The rate of onto-and phylogenic modification of the sense organs of cave animals, (D) Regeneration.

For the study of (C) cave animals, the facilities of the Department are ideal. The University is located at the edge of the great cave region. By act of the Legislature the Donaldson estate near Mitchell, Indiana, has been placed in the keeping of the trustees of Indiana University. On it are situated numerous sink holes, dry caves and an underground water-course at least two miles long. This underground river is rich in blind fishes and other blind aquatic animals. A small laboratory dwelling has been erected on the farm and is in charge of a research assistant appointed from year to year. Applications for the assistantship should be sent to C. H. Eigenmann. Applicants must be able to be self-directive in large measure. In the study of cave animals the Department has in the past had the cooperation of the Carnegie Institution, the American Association for the Advancement of Science. and the Elizabeth Thompson Science Fund.

For the study of (B) variation in non-migratory vertebrates in a unit of environment this Department organized and has since maintained a freshwater Biological Station. It is at present located on Winona Lake. Kosciusko County, Indiana, in the grounds of the Winona As sembly. The Station owns two buildings, 20x45 feet, each two stories high. The buildings are on the lake front, at the mouth of Cherry Creek. The Station also owns boats, nets, sounding and temperature apparatus, glassware, etc. Microscopes and other needed apparatus are moved to the Station from the University.

For the study of (D) regeneration, under the sole direction of Dr. Zeleny, the Department owns all the necessary glassware, and a small stream flowing through the

⁴Further information concerning the Station will be found in the announcement of spring and summer courses, for which address the Registrar.

campus, and various small polds about Bloomington, offer an abundance of material.

The Department receives many of the leading zoölogical journals. Advanced students have access, besides, to the professor's private library, which is rich in papers dealing with variation, heredity, limnology, speleology, vertebrate embryology, and fishes.

COURSES FOR UNDERGRADUATES

- 1. Elementary Zoölegy. 15 hours.
- 2a. Vertebrate Zoëlogy. 5 hours.
- 2b. Embryology. 5 hours.
- 2c. Cellular Biology. 5 hours.

COURSES FOR GRADUATES OR UNDERGRADUATES

3. Advanced Zoölogy. The work in this course is entirely individual. Each student selects, with the coöperation of the professor, some limited subject for special investigation. This course will serve for each student as an introduction to his special work in the Graduate School. Professor Eigenmann and Associate Professor Zeleny.

Fall, Winter, and Spring terms, one to fifteen hours a week. Selected monographs.

4a. General Biological Problems: The development of the idea of evolution and Darwinism. Lectures and reports. Professor EIGENMANN.

Winter term, M. W. F., at 8:00.

- 4b. General Biological Problems. The laws and theories of heredity. Lectures and reports. Professor EIGENMANN. Spring term, T. Th., at 8:00.
- Seminary. Weekly meetings of advanced students and instructors to discuss current literature and report on investigations in progress. Professor Eigenmann and Associate Professor Zeleny.

Fall, Winter, and Spring terms, M., at 4:00.

COURSES FOR GRADUATES

6. Research. Special investigation of zoölogical problems, with a report on each investigation. Branches in which subjects have in the past been selected and reported upon are Variation, Degeneration, Regeneration, Sense Organs, Embryology of Fishes, Faunal and Systematic Studies of Fishes, Ecology of Cave and Freshwater Animals. For a fuller statement, see the general account of the Department. Professor Eigenmann and Associate Professor Zeleny.

Fall, Winter, and Spring terms, daily; 8:00 to 4:50.

 Biological Survey. A continuation of the previous year's work in the physical and biological features of Winona Lake and its environs. Professor Eigenmann.

Summer terms at the Biological Station.

The results obtained by students in Courses 3, 6 and 7, together with articles of the permanent staff of the Department, are published in various ways as contributions from the Zoölogical Laboratory of Indiana University. Of this series 97 numbers have been completed. A list of the titles from 1 to 58 was published in the Bulletin, vol. I, No. 4 (November, 1903), and subsequent additions in catalogue numbers of the Bulletin, vols. I, III, IV, V, and VI. Ninety-two numbers have been published.

DEPARTMENT OF ANATOMY

Burton D. Myers, Professor. Augustus G. Pohlman, Professor.

Undergraduates selecting Anatomy as their major subject are required to complete Courses 1, 1a, 2, 2a, 3, 4, 5, 8, a total of 34 hours, with such further work in Courses 9, 10, and 15 as in the particular case may seem desirable. In addition the candidate must have had 15 hours' Physiology or 12 hours' Pathology, and Zoölogy 2b.

Graduate courses are given under Course 13, the work of Courses 9, 11, and 15 being undergraduate or graduate, according to the character of the work and preparation for the course.

COURSES FOR UNDERGRADUATES

- 1, 1a, 2, 2a and 3. Dissection, 17 hours.
- 4. Osteology. 3 hours.
- 5. Neurology. 4 hours.
- S. Histology. 10 hours.
- 10. Histological Technique. 2-5 hours.
- 14. Elementary Anatomy. 5 hours.
- 16. Clinical Anatomy.

COURSES FOR UNDERGRADUATES OR GRADUATES

- 9. Topographical Anatomy.
- 11. Splanchnology.
- 15. Advanced courses in Anatomy.

COURSE FOR GRADUATES

13. Research Work.

PHYSIOLOGY AND PHARMACOLOGY

WILLIAM J. MOENKHAUS, Professor. Dennis E. Jackson, Assistant Professor.

Candidates for the degree of Bachelor of Arts with Physiology as the major subject take Courses 3 or 4, 5, 6 and 7. Facilities for research leading to the higher degrees are available within restricted lines in general Physiology.

COURSES FOR UNDERGRADUATES

- 1. Elementary Physiology and Hygiene. 5 hours.
- 3. General Physiology. 10 hours.
- 4. Human Physiology. 9 hours.
- 5. Experimental Physiology. 6 hours.

COURSES FOR UNDERGRADUATES AND GRADUATES

 Advanced Physiology. A comprehensive experimental study of some selected phase of mammalian physiology or of general physiology. Laboratory work and assigned reading. Professor MOENKHAUS.

Fall, Winter, and Spring terms, at hours to be arranged.

 Pharmacology. An experimental course in the physiological action of the more important drugs upon mammals and amphibia. Assistant Professor Jackson.

Spring term, M. W. F., 1:00 to 4:50.

Open to students who have passed in Courses 4 and 5.

COURSE FOR GRADUATES

 Research. Problem work in certain phases of general physiology may be taken by those properly equipped. Professor MOENKHAUS.

Fall, Winter, and Spring terms, daily, 8:00 to 3:50.

DEPARTMENT OF PATHOLOGY

HENRY R. Alburger, Professor.

The Department of Pathology is located in four large, well-lighted rooms on the third floor of Wylie Hall. These consist of a very large main laboratory, a lecture room and museum, an incubator and sterilizing room, and a private office for the head of the Department.

The main laboratory is capable of seating fifty or more workers at laboratory desks, is lighted from the north by

large windows running to lights, and contains a full teriology and Patholog built in two smaller rology and Pathology and into the main room by an aroom, containing incubators, steblood serum inspissator, water stintric centrifuges. The room also contamals for immediate use.

Next to the main laboratory is a smaller rod of seating fifty students at lecture. It is als a museum. Here a collection of gross pathologimens is rapidly being accumulated and mounted in ner convenient for study and reference.

The office of the head of the Department is near at hand and is furnished with a very complete working reference library containing the majority of the periodicals on the subjects covered by the Department, in English, German and French.

In connection with the Department there is an animal barn in which are kept a number of the small laboratory animals for use in research.

The apparatus and equipment is ample for any ordinary line of research in Pathology, and is of the best quality. No expense has been spared by the University to make the equipment of this Department complete.

The undergraduate work consists of three terms' work of six hours each, covering the subjects of Bacteriology, General Pathology, and Special Pathology. (See Catalogue.)

UNIVERSITY

DERGRADUATES



SE FOR GRADUATES

or who show especial ability may obtain an opporty to enter upon advanced diagnostic work or research cunder the direction of the head of the Department. sopportunity can only be offered to a limited number, out facilities can be offered for work along any of the lines of Pathological or Bacteriological research. Professor Alburger.

Fall, Winter, and Spring terms, daily, 8:00 to 4:50.





9/10 VII, No. 5

JUNE 1, 1909

INDIANA UNIVERSITY BULLETIN



GRADUATE SCHOOL
1909

Entered as second-class matter May 16, 1908, at the postoffice at Bloomington, Indiana, under act of Congress of July 16, 1804

"The highest Function of the real University is that of Instruction by Investigation. The Essential Quality of the University is the presence in its Faculty of Men qualified to do University Work. It matters not how many or how few the Subjects taught, or what may be the Material Equipment of the Teacher, the School in which Study and Investigation go hand in hand is, in its degree, a University."—David Start Jordan.

THE REPORT OF A STORY

INDIANA UNIVERSITY BULLETIN

VOL. VII

BLOOMINGTON, IND., JUNE 1, 1909

NO. 5

Entered as second-class matter May 16, 1908, at the postoffice at Bloomington, Indiana, under the Act of July 16, 1894. Published from the University office, Bloomington, Indiana, semi-monthly April, May, and June, and monthly January, February, March, July, September, and November.

Historical Sketch of Graduate School

THE Indiana University, situated at Bloomington, Indiana, is the State University of Indiana and the head of the public school system of the State. It takes its origin from the State Seminary, which was established by act of the Legislature, approved January 20, 1820. In 1828 the title of the Seminary was changed by the Legislature to that of the Indiana College; and in 1838 the University was given its present name and style. In 1867 Indiana University became coeducational.

The University consists at present of—
The College of Liberal Arts, organized in 1824,
The Law School, organized in 1842, re-organized in 1889,
The School of Medicine, organized in 1903,
The Graduate School, organized in 1904,

The School of Education, organized in 1908.

The first advanced degrees, conferred for graduate work, were granted in 1882. During the eighties well defined regulations for graduate work and graduate degrees were stated in the University catalogue, and a considerable number of graduate students were enrolled, especially in the natural sciences. In the years 1882 to 1893, inclusive, the University graduated 14 Doctors of Philosophy, 99 Masters of Arts, and 12 Masters of Science. For some years following 1893, however, the degree Doctor of Philosophy was not conferred.

In 1904 there took place a segregation and formal organization of the Graduate School, and in 1908 the office of Dean of the Graduate School was created.

An outline of the scholarly work of the University to the time of the organization of the Graduate School will be found on pages 197-348 of the volume entitled 'Indiana University, 1820-1904'. About 4,000 titles of books and articles by members of the University are there listed.

Recent contributions to knowledge by members of the University, not listed in the above mentioned volume, are given in the present Bulletin, at the end of the statements of the various Departments. The numbers prefixed to the titles are in continuation of those given in the bibliography published in 1904.

C In2u28 1909

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University Calendar

FALL TERM, 1909-10

Sept. 21, Tuesday. Matriculation and registration of students; enrollment in classes.

Sept. 22, Wednesday. Recitations and lectures begin.

Nov. 25 and 26, Thursday

and Friday. Thanksgiving recess.

Dec. 22, Wednesday, 6 p. m. Fall term ends.

WINTER TERM, 1909-10

Jan. 4, Tuesday. Registration and enrollment in classes

for the Winter term.

Jan. 5, Wednesday. Recitations and lectures begin.

Jan. 20, Thursday. Foundation day, a holiday. Feb. 22, Tuesday. Washington's birthday, a holiday.

Mar. 25, Friday, 6 p. m. Winter term ends.

SPRING TERM, 1909-10

April 5, Tuesday. Registration and enrollment in classes for Spring term.

April 6, Wednesday. Recitations and lectures begin.

June 17, Friday, 6 p. m. Spring term ends.

June 19, Sunday, 7:30 p. m. Baccalaureate address.

June 22, Wednesday, 10 a. m. Commencement.

Officers and Faculty of the Graduate School

ADMINISTRATIVE COUNCIL

CARL II EIGENMANN, Ph.D., Professor of Zoölogy, Dean of the Graduate School.

HAROLD WHETSTONE JOHNSTON, Ph.D., L.H.D., Professor of Latin.
ARTHUR LEE FOLEY, Ph.D., Professor of Physics.

ULYSSES GRANT WEATHERLY, Ph.D., Professor of Economics and Social Science.

Ernest Hiram Lindley, Ph.D., Professor of Philosophy and Psychology.

Samuel Bannister Harding, Ph.D., Professor of European History. Bert John Vos, Ph.D., Professor of German.

FACULTY

WILLIAM LOWE BRYAN, Ph.D., LL.D., President of the University.

Horace Addison Hoffman, A.M., Professor of Greek.

James Albert Woodburn, Ph.D., Professor of American History and Politics.

Carl II Eigenmann, Ph.D., Professor of Zoölogy, and Director of the Biological Station.

Harold Whetstone Johnston, Ph.D., L.H.D., Professor of Latin.

ROBERT EDWARD LYONS, Ph.D., Professor of Chemistry.

ARTHUR LEE FOLEY, Ph.D., Professor of Physics.

DAVID MYERS MOTTIER, Ph.D., Professor of Botany.

Albert Frederick Kuersteiner, Ph.D., Professor of Romance Languages. ULYSSES GRANT WEATHERLY, Ph.D., Professor of Economics and Social Science.

ERNEST HIRAM LANDLEY, Ph.D., Professor of Philosophy and Psychology.

BURTON DORR MYERS, A.M., M.D., Professor of Anatomy.

SAMUEL BANNISTER HARDING, Ph.D., Professor of European History.

Amos Shartle Hershey, Ph.D., Professor of Political Science and International Law.

Bert John Vos, Ph.D., Professor of German.

WILLIAM A RAWLES, Ph.D., Professor of Political Economy.

Carl W. F. Osthaus, Professor of German.

Schuyler Colfax Davisson, Sc.D., Professor of Mathematics.

David Andrew Rothrock, Ph.D., Professor of Mathematics.

WILLIAM J MOENKHAUS, Ph.D., Professor of Physiology.

WARNER FITE, Ph.D., Professor of Philosophy.

WILL DAVID HOWE, Ph.D., Professor of English.

AUGUSTUS GROTE POHLMAN, M.D., Professor of Anatomy.

Henry Rihl Alburger, M.D., Professor of Pathology.

WILLIAM WESLEY BLACK, A.M., Professor of the Science and Art of Teaching.

ELMER ELLSWORTH JONES, Ph.D., Professor of the History and Philosophy of Education.

CHARLES JACOB SEMBOWER, A.M., Professor of English.

EDGAR ROSCOE CUMINGS, Ph.D., Professor Geology.

Frank William Tilden, A.M., Associate Professor of Greek.

Guido Hermann Stempel, A.M., Associate Professor of Comparative Philology.

Rolla Roy Ramsey, Ph.D., Associate Professor of Physics.

OLIVER W Brown, A.M., Associate Professor of Chemistry.

Frank Marion Andrews, Ph.D., Associate Professor of Botany.

LILLIAN GAY BERRY, A.M., Associate Professor of Latin.

HENRY THEW STEPHENSON, B.S., A.B., Associate Professor of English. Frank Aydelotte, A.M., B.Litt., Associate Professor of English, Wilbur Adelman Cogshall., A.M., Associate Professor of Astronomy. Ulysses Sherman Hanna, Ph.D., Associate Professor of Mathematics.

Joshua Whliam Beede, Ph.D., Associate Professor of Geology.
Edward Payson Morton, A.M., Assistant Professor of English.
James M Van Hook, A.M., Assistant Professor of Botany.
Frank Curry Mathers, Ph.D., Assistant Professor of Chemistry.
Clarence Earl May, Ph.D., Assistant Professor of Chemistry.
Dennis Emerson Jackson, Ph.D., Assistant Professor of Physiology.
Vernon Andrew Suydam, B.S., Instructor in Mechanics.

General Statement

Purpose and Administration. The Graduate School furnishes opportunities for advanced work leading to careers in higher education and in certain lines of investigation. It does not offer work leading to professional degrees in Law or in Medicine.

The work of the School is a direct continuation of that of the College of Liberal Arts, and as such is the most advanced work in education undertaken by the State. The Graduate School stands, therefore, at the head of the University, and is the culmination of the public school system of the State.

The school is administered by the Council of the Graduate School. It is composed of members of the Faculty representing different fields of learning.

Not all Departments of the University are at present equally equipped for extended graduate work. In recognition of this fact, the amount and nature of the graduate work offered by the different Departments varies. Some Departments offer work for the A.M. degree only, while others offer work leading to the degree Ph.D.

Admission. Students holding the degree A.B. from this institution, or the same degree or its equivalent from similar educational institutions, are admitted to the Graduate School on presentation of the proper credentials.

All graduate students will enroll at the beginning of each term, and those entering regularly organized classes will submit to the same regulations as undergraduate students. Work will in many cases be individual and not controlled by a recitation schedule. At the time of entrance to the Graduate School the student must submit a plan of the entire work he wishes to present for the A.M. or Ph.D. degree. This plan must be approved by the professor of the major subject and the Dean of the Graduate School.

Fees. Tuition in the University is free. A contingent fee of five dollars a term is charged all students. It covers in part the cost of the physical maintenance of the University, and is not applied to the cost of tuition, which is provided wholly by the State.

The Library fee is one dollar a term.

The Laboratory fees are one dollar per credit hour in all courses.

The Gymnasium fee, if the work in physical training is taken, is one dollar a term.

An Examination fee of one dollar is charged for each make-up or special examination. This fee is paid to the Bursar, and his receipt when presented to the proper instructor constitutes his authorization for holding the examination.

The fee for any Degree is five dollars, and must be paid to the Bursar at least thirty days before the granting of the degree, and a receipt for it filed with the Registrar.

Expenses. The expenses of the student will vary, of course, according to his mode of living. Most of the students lodge in private houses and board in clubs. Rooms occupied by one person vary as to rent from one dollar to three dollars a week. Two students rooming together pay as a rule from one to two dollars each; at the latterate, fuel and light should be included. Rooms are generally engaged by the term and are paid for weekly.

Board may be had in clubs at two dollars and a half to three dollars and a half a week, payable weekly. Board in hotels and restaurants costs from four to five dollars.

Buildings. The campus of the University adjoins the town, and contains about seventy acres of elevated ground, partly covered with a heavy growth of maple and beech.

The University offices are in *Maxwell Hall*, a fireproof building of white limestone, erected in 1890, which, with an extension recently completed, also houses the School of Law

Owen Hall, a brick building erected in 1884, contains the museum, and (at present) the lecture rooms and laboratories of the Departments of Zoölogy and Botany.

Wylie Hall, also of brick, erected in 1884, contains the laboratories and lecture rooms of the Departments of Chemistry and Pathology, and the rooms of the Department of Mathematics.

Kirkwood Hall, of white limestone, built in 1895, contains the rooms of the Departments of English, History, Economics, Greek, Latin, Romance Languages, and German.

Mitchell Hall is a frame building formerly used for the Women's Gymnasium.

Kirkwood Observatory, completed in 1900, is a two-story building of white limestone, occupied by the Department of Mechanics and Astronomy.

The Men's Gymnasium, a large frame building finished in 1896, is used also as an assembly hall for public exercises and entertainments.

Science Hall, built in 1903 of limestone, is one of the largest buildings on the campus, and is occupied by the

Departments of Physics, Philosophy, Education, Geology, Anatomy, and Physiology.

The *Library Building*, completed in 1908, houses also the collections of the Department of Fine Arts.

The construction of a New Science Building, to be occupied principally by the biological sciences, will be begun in the fall of 1909.

A Student Building of white limestone contains an east wing for men students, a west wing for women students (including the Women's gymnasium and swimming pool), and a small auditorium in the center seating 600 persons.

For an account of the buildings of the Biological Station see under the Department of Zoölogy.

The Library. The Library of Indiana University at present contains sixty-six thousand catalogued volumes. The selection of these books has been made by experts within the last twenty-two years with a view to facilitating instruction and research. While the collection is a well-balanced one, it is especially strong in literary and scientific periodicals. The list of periodicals received and permanently kept on file by the library numbers about four hundred publications, including American, English, German, and French, and one each of Italian, Spanish, and Swedish. The library is made thoroughly usable by a carefully-made card catalogue, by indexes, and other bibliographical aids. The Library force consists of a librarian and ten assistants, all of whom are at the service of any authorized user of the library.

In the library building are seminary rooms for the Departments of History, Economics, English, Philosophy, Modern Languages, Educational, Latin, and Greek.

In addition to the central library where the general,

literary, and historical collections are housed, there are nine departmental collections of varying sizes kept in the different University buildings.

All books, with the exception of periodicals and books reserved for reference, may be drawn for home use, each student having the privilege of drawing three books for two weeks.

The Library is open Mondays to Fridays from 7:45 a.m. to 10:00 p.m., and Saturdays from 8:00 a.m to 5:00 p.m.

Departmental Clubs. The Physics Club, an organization of the teachers and advanced students of the Physics Department, meets fortnightly to hear reports on research work and to discuss recent advances in physical science.

A History Club, composed of the History faculty, graduate students and seniors majoring in History, and such other students as may be elected to membership, meets fortnightly to discuss topics of historical interest and to promote social intercourse.

The Philosophy Club, composed of instructors and students of the Department of Philosophy, holds fortnightly meetings for the discussion of philosophical questions.

The English Club, consisting of the English instructors, students who have English as their major, and such other students as may be elected to membership, meets once each fortnight. The purpose of the club is to promote good fellowship.

The Euclidian Circle is a mathematical club made up of instructors and students above Freshman rank. Its meetings are held on the second and fourth Mondays of each month.

The Goethe Gesellschaft is a club composed of men and women interested in German, and has for its object the practical study of the German language and the promotion of the social advantages of its members.

The Cercle Français, reorganized in 1905, is a club open to all members of the Department of Romance Languages past the Freshman year, and twice a month holds social gatherings at which French alone is spoken.

The Zoölogical Club, organized in 1882, meets every Monday during term time.

The Geological Club, organized in 1907, meets on alternate Wednesdays during term time.

The Graduate Club of the School of Education has for its purpose the promotion of research in Education, and the encouragement of fellowship and coöperativeness among the graduate members of the School of Education.

DEGREES

Two advanced degrees, Master of Arts and Doctor of Philosophy, are conferred by the University.

Master of Arts. The degree of Master of Arts may be conferred upon graduates of this University, or of any other institution of equivalent standing, following a residence at the University of a minimum of three full terms and the completion of a minimum of forty-five hours of University credit. Thirty of the total of forty-five hours must be in one Department, or in closely allied Departments. Fifteen hours must be distinctly graduate in character. Graduates of this University may be given leave of absence for one term of the required year to pursue a specific investigation.

Of the required three terms of residence, graduates of other institutions shall take at least two terms in succession. In or before June, 1910, the Master's degree may be conferred upon graduates of this University upon the completion in absence of fifteen hours a term, or equivalent work, carried during at least two full years under the direction of the Faculty, hours of private work done in absence being estimated at one-half the credit value of work done at the University. After June, 1910, no degrees will be conferred for work in private non-residence study.

Professional studies are not accepted for this degree, but research work on professional subjects may be accepted at the option of the professor in charge of the major subject.

A thesis is required in all Departments except that of Latin.

Doctor of Philosophy. The degree of Doctor of Philosophy may be conferred upon graduates of this University, or of any institution of similar character and rank, upon the completion of an advanced course of study of no less than three years. On the recommendation of the professor in charge of the major subject, and with the concurrence of the Council of the Graduate School, part of this time may be spent in study at other universities.

The course of study for the degree of Doctor of Philosophy must be pursued under the direction of a committee consisting of the heads of the Departments in which the work is done, and its value shall be determined by a final examination and by the presentation of a satisfactory thesis, usually embodying original work upon some prescribed or accepted subject, and which must always give evidence that the candidate is capable of forming an independent judgment upon the recent literature of his department. In each case a detailed statement, indorsed by the professor in charge of the major work, shall be

submitted to the Council of the Graduate School not later than May 10 of the year in which the candidate presents himself for examination.

The thesis of every candidate for the degree of Doctor of Philosophy shall be presented to the Council of the Graduate School on or before the first day of June of the year in which he proposes to take the degree. The thesis shall be indorsed by the head of the Department as being in its final form and ready for the press. Examinations of each candidate for this degree will be conducted before a committee consisting of all the instructors under whom graduate work has been taken. If the candidate is recommended for the degree, arrangements must be made to deposit five printed copies of the thesis in the library.

At least one year before the final examination the candidate shall satisfy the professor in charge of the major subject of his ability to use French and German for purposes of investigation.

Application for Degrees. Application for the degree Master of Arts or Doctor of Philosophy must be filed with the Dean at the time of admission to the Graduate School. Application for the degree Doctor of Philosophy must be on file at least one year before the candidate is admitted to the examination.

TEACHING FELLOWSHIPS

A number of teaching fellowships are available for graduate students.

The Teaching Fellows are relieved from all term fees, and the fellowship carries with it an honorarium of between \$200.00 and \$500.00 annually. The highest amount will ordinarily be paid only if the incumbent is

appointed for a third year. A Teaching Fellowship is primarily a recognition of scholarship. Not less than two-thirds of each Fellow's time must be devoted to work leading to the Doctorate in Philosophy; but he will be required to give a portion of his time to the University.

A Fellow may be appointed for three separate years, but not for more. Appointments are for one year, and do not imply a reappointment.

Following is the list of Teaching Fellows for 1908-09:

ROSCOE BEALS, A.B., Teaching Fellow in English.
CAROLINE ANNA BLACK, A.B., Teaching Fellow in Botany.
WALTER BLAINE DUNCAN, A.B., Teaching Fellow in Chemistry.
CECIL OTIS GAMBLE, A.B., Teaching Fellow in Chemistry.
ALBERT FREDERICK O. GERMANN, A.B., Teaching Fellow in Chemistry.
CHARLES CLANCY GRANDY, A.B., Teaching Fellow in Pathology.
CORA BARBARA HENNEL, A.M., Teaching Fellow in Mathematics.
BALLINGTON CHARLES KETTLEBOROUGH, A.M., Teaching Fellow in History.

Edward William Koch, A.B., Teaching Fellow in Physiology. Norman Eugene McIndoo, A.B., Fellow in charge of Donaldson Farm Experiment Station.

CARL WILLIAM PARKER, A.B., Teaching Fellow in Economics.
HOMER BLOSSER REED, A.B., Teaching Fellow in Psychology.
MABEL TIBBOTT, A.B., Teaching Fellow in History.
WILLIAM MOTIER TUCKER, A.B., Teaching Fellow in Geology.
KENNETH POWERS WILLIAMS, A.B., Teaching Fellow in Mathematics.
WILLIAM LOGAN WOODBURN, A.B., Teaching Fellow in Botany.

Departments and Graduate Courses of Instruction

In the following list are included many courses which are open alike to graduates and advanced underclassmen. The strictly undergraduate courses are described in the catalogue of the University.

DEPARTMENT OF GREEK

Horace A. Hoffman, Professor. Frank W. Tilden, Associate Professor.

Undergraduates choosing Greek as their major subject are required to take sixty hours' work in the Department, selected after consultation with the professor.

The time that at the present may be profitably devoted to graduate work in Greek is one year, leading to the degree of A.M.

The Department is well equipped for doing satisfactory work leading to the degree of Master of Arts. Besides the most important reference books, cyclopaedias, dictionaries, lexicons, indexes, and standard editions of Greek writers, an effort has been made to build up an especially good collection of works treating of Euripides, since seminary work is offered in that author. The Department has the chief older editions as well as nearly all of the later ones, and many special works bearing on Euripides.

The Library contains the most important classical journals, among them complete sets of 'The American

Journal of Philology'; 'The American Journal of Archaeology'; 'The Classical Review'; Chicago, Cornell, and Harvard Studies; 'Hermes'; 'Jahrbücher für classische Philologie'; Mitteilungen d. deutsch. arch. Inst. in Athen'; 'Philologus'; 'Rheinisches Museum'.

Among the most valuable works in the field of Archaeology and Art the following may be named: 'Antike Denkmäler'; 'Ausgrabungen von Olympia'; 'Carapanos'; 'Dodona'; Hamdey-Bey and Reinach's "Nécropole à Sidon'; Homolle's 'Fouilles de Delphes'; Ohnefalsch-Richter's 'Cypros, die Bibel und Homer'; Overbeck's 'Griechische Kunstmythologie'; Stackelberg's 'Die Gräber der Hellenen'; and the publications of the American and British Schools of Athens, and of the Egyptian Exploration Fund. Among the works on Inscriptions and Epigraphy the following may be mentioned: 'Corpus Inscriptionum Graecarum'; 'Corpus Inscriptionum Atticarum'; Inscr. Graec. Septentrionalis, Siciliae, Italiae, Pelopon., Insularum, etc., and the important writings of such authorities as Klein, Kretschmer, Meisterhans, etc. For Palaeography and the study of the Papyri are the following: Works by Grenfell, Hunt, Kenyon, Mahaffy, Mayser, Mitteis, Thompson and Wilkin. In the important field of vase-painting, the Library contains many valuable works. Among the most noteworthy are: Benndorf's 'Griechische und Sicilische Vasenbilder'; Collignon and Rayet's 'Histoire de la Céramique grecque'; Dechelette's 'Les Vases ceramiques ornés de la Gaule romaine'; Furtwängler and Loeschke's 'Mykenische Vasen,' and 'Mykenische Thongefässe'; Furtwängler and Reichhold's 'Griechische Vasenmalerei': Harrison and McColl's 'Types of Greek Vases,' and various books by Gardner, Huddilston, Klein, Kretschmer, Murray, Smith and Walters.

The Department also owns upwards of 700 photographs of landscapes, buildings and works of art in Greece, Italy and Sicily; and has many lantern-slides, busts, casts, a model of the Acropolis at Athens, and a series of reproductions of the famous Tanagra Figurines.

Graduate Seminary: Euripides. (A) Wednesdays: "The Phenicians". Professor Hoffman. (B) Fridays: "The Alcestis". Associate Professor Tilden.

Fall, Winter, and Spring terms, W. F., 3:00 to 5:00.

Open to graduates only. A reading knowledge of German is a requisite for the work.

DEPARTMENT OF LATIN

HAROLD WHETSTONE JOHNSTON, Professor of Latin. LILLIAN GAY BERRY, Associate Professor. KEITH PRESTON, Instructor.

The Department is adequately equipped for the courses offered below. Besides sets of Classical journals and reviews (see the detailed statement above under the Department of Greek), the library contains the essential works of reference on the various disciplines, all general and special lexicons and indexes of recognized value, various sets of texts, the latest critical editions and commentaries, together with many of historical interest, and collections of monographs and dissertations intended to illustrate those authors that are made the subjects of special investigation and seminary work. The Department has an office and two recitation rooms in Kirkwood Hall, and shares with the Department of Greek a seminary room in the Library. The private library of the head of the Department is at the service of graduate students.

[33. The Prose Writers of the Republic. Selections from Cato, Sallust, Cicero, and Hirtius, with the critical study of the text of one of these authors so far as it is read in the class Students are expected to be able to read German. Professor Johnston.]

Course 33 and 34 are given in alternate years. Omitted in 1909-10.

34. The Poets of the Republic. Selection from Plantus, Terence, Lucretius, and Catullus, with the critical study of the text of some one of these authors so far as read in the class. Fall, Winter and Spring terms, M. W. F., at 9:00.

If course 33 is taken in the undergraduate course, Course 34 should be made a part of the graduate work, and vice versa.

41. The Topography and Mounments of Ancient Rome. Recitations, lectures, and assigned readings. Associate Professor Berry.

Fall, Winter, and Spring terms, once a week, at an hour to be arranged.

Platner, 'Ancient Rome'.

42. Readings in Latin Literature. The student will be gnided and assisted in reading very considerable portions of those authors not included in other courses, with stress laid upon the subject-matter rather than upon the language and style. Aualyses and summaries will be prepared by the students and criticised by the instructor. Professor Johnston and Associate Professor Berry.

Fall, Winter, and Spring terms, once a week, at an hour to be arranged.

 Advanced Composition. This course is intended especially for teachers, but may be taken by any persons who need practice in writing Latin. Professor Johnston and Mr. Preston.

Fall, Winter, and Spring terms, once a week, at an hour to be arranged.

Open to graduates and teachers of Latin.

50. Seminary. The critical study of the text of some standard author, with incidental investigation of problems in syntax, style, prosody, and so forth. In past years Caesar, Sallust, Tacitus, and Plautus have been made the subjects of similar work. In 1909-10 it is proposed to make a study of Terence. The student should be provided with the critical edition of Umpfenbach and the text editions of Dziatzko and Fleckeisen. Professor Johnston.

Fall, Winter, and Spring terms, M., 2:00 to 3:50. Open to students who have had one year's graduate work.

DEPARTMENT OF ROMANCE LANGUAGES

ALBERT F. KUERSTEINER, Professor of Romance Languages.

George D. Morris, Associate Professor of French.

Charles A. Mosemiller, Associate Professor of Romance Languages.

Undergraduates electing Romance Languages as their major subject are required to take sixty hours of work in the Department. The choice of courses must be approved by the head of the Department.

The Department offers one year of Graduate work, all in French.

The Library is well equipped with works in French criticism. It contains, moreover, all of the volumes of the 'Grands Ecrivains de la France' series published thus far, and complete sets of 'Romania,' 'Zeitschrift für Romanische Philologie,' 'Archiv für das Studium der Neueren Sprachen,' 'Französische Studien,' 'Revue des deux Mondes,' 'Revue de Cours et Conférences,' 'Biblioteca de Autores Españoles,' besides a fair selection of works in French and Spanish literature.

13. Old French. Reading of texts; study of derivations, and an exposition of the simpler phonetic laws involved in the change from Popular Latin into Old French and Modern French. Lectures. Professor Kuersteiner.

Fall, Winter, and Spring terms. T. Th., at 9:00.

Paris, 'Extraits de la Chanson de Roland'; Suchier, 'Aucassin et Nicolete' (French edition); Paris-Langlois, 'Chrestomathie du Moyen Age'.

Open to graduate students who have studied French and Latin, and also to undergraduates who have passed in Courses 4 and 19.

28. Senior Composition. Drill in translation of literary English into literary French. Writing of French themes and letters.

The work is conducted in French. Associate Professor MOSEMILLER.

Fall, Winter, and Spring terms. T. Th., at 3:00.

Open to students who have passed in Courses 1, 4, and 26, or their equivalent.]

Omitted in 1908-09.

PUBLICATIONS BY MEMBERS OF THE DEPARTMENT

CHARLES A. MOSEMILLER.

- 3. 'Etymology of $m\hat{a}che\text{-}fcr$ '. In Modern Language Notes, Dec., 1905.
- 4. 'Etymologies of cotret, dèche, palier, sablière'. In Modern Language Notes, May, 1907.
- 'Trumeau, trumer, trimer et quelques autres dérivés du latin torus en Gaule'. In Modern Language Notes, May, 1908.

DEPARTMENT OF GERMAN

Bert J. Vos, Professor of German. Carl W. F. Osthaus, Professor. Eugene Leser, Assistant Professor.

In combination with the Department of Comparative Philology, which gives courses in Gothic and Old High German, the Department at present offers two years of Graduate work. The library is well equipped with books for the special study of Classical and Nineteenth Century German literature. The list of current publications received includes the following: 'Alemannia'; 'Allgemeine Zeitung' (München); 'Archiv für das Studium der neueren Sprachen und Literaturen'; 'Arkiv för nordisk Filologi'; 'Beiträge zur Geschichte der deutschen Sprache und Literatur'; 'Bibliothek des litterarischen Vereins in Stuttgart'; 'Columbia University Germanic Studies'; 'Das Litterarische Echo'; 'Euphorion'; 'Forschungen zur neueren Literaturgeschichte'; 'German-American Annals'; 'Goethe Jahrbuch'; 'Indogermanische Forschungen'; 'Jahrbuch des freien deutschen Hochstifts'; 'Jahrbuch der Grillparzer Gesellschaft'; 'Jahrbuch des Vereins für niederdeutsche Sprachforschung'; 'Jahresbericht über die Erscheinungen auf dem Gebiete der Germanischen Philologie'; 'Jahresberichte für neuere deutsche Litteraturgeschichte': 'Journal of English and Germanic Philology': 'Korrespondenzblatt des Vereins für niederdeutsche Sprachforschung'; 'Literaturblatt für germanische und romanische Philologie'; 'Modern Language Notes': 'Modern Language Review': 'Modern Philology'; 'Publications of the Modern Language Association of America'; 'Quellen und Forschungen'; 'Veröffentlichungen des Schwäbischen Schiller Vereins'; 'Zeitschrift des Allgemeinen deutschen Sprachvereins'; 'Zeitschrift des Vereins für Volkskunde'; 'Zeitschrift für Bücherfreunde'; 'Zeitschrift für deutsches Altertum'; 'Zeitschrift für den deutschen Unterricht'; 'Zeitschrift für deutsche Philologie'; 'Zeitschrift für deutsche Wortforschung'; 'Zeitschrift für vergleichende Litteraturgeschichte'.

For Gothic and Old High German, see Courses 4 and 9 of the Department of Comparative Philology. Course 14 may be taken either as a graduate or undergraduate course.

14. German Usage, A study of the more difficult points in German grammar, with reference to the spoken language of the present day and to the usage of representative authors. Designed especially for students who intend to teach German. Assistant Professor Leser.

Winter and Spring terms, T. Th., at an hour to be appointed. Matthias, 'Kleiner Wegweiser durch die Schwankungen und Schwierigkeiten des deutschen Sprachgebrauchs'.

- [19. German Romanticism. Lectures, discussions, and reports.] Omitted in 1909-10.
- [20. Lessing: Life and Works. Lectures, and reports by members of the class upon subjects assigned for special study.] Omitted in 1909-10.
- Studies in the recent German Drama. Professor Osthaus.]
 Omitted in 1909-10.
 - 28. Journal Club. This course is introductory to the work of the German Seminary. Members make reports upon the contents of current numbers of journals devoted to German literature and philology, and are trained in the use of important works of reference, Professor Vos.

Fall term, two hours weekly, at an hour to be appointed.

German Seminary: Goethe's Lyrical Poems. Professor Vos.
Winter and Spring terms, two hours weekly, at an hour to be
appointed.

Open to students who have completed Course 28.

- [27. Middle High German. Outline of the phonology, accidence and syntax. Reading of selections from the lyric poets, the popular and court epic. Professor Vos.]
- 29. History of the German Language. The relation of German to other Germanic languages; the dialectic divisions of Modern German; origins of the literary language; changes since the middle period; history of German orthography. Conducted partly in German. Professor Vos.

Winter term, two hours weekly, at an hour to be appointed.

Behaghel, 'Die deutsche Sprache' ('Das Wissen der Gegenwart', Band 54).

PUBLICATIONS BY MEMBERS OF THE DEPARTMENT

ERNEST H. BIERMANN.

- 1. 'German Prose Composition'. (Joint author with C. W. F. OSTHAUS.) New York, 1909. Pp. 191.
- 2. 'Easy German Stories by C. E. Ries. With notes and vocabulary'. New York, 1909. Pp. 180.

CHARLES D. CAMPBELL.

 'The Names of Relationship in English. A contribution to English semasiology'. (Strassburg Dissertation.) Strassburg, 1905. Pp. x, 139.

CARL W. F. OSTHAUS.

1. 'German Prose Composition'. (Joint author with E. H. BIERMANN.) New York, 1909. Pp. 191.

BERT JOHN Vos.

- Review of 'The Saga of Walther of Aquitaine', by M. D. Learned. Modern Language Notes, viii, 377-380.
- 2. Review of Henrici's edition of Hartmann von Aue's 'Iwein'. Modern Language Notes, ix, 185-189.
- 3. Review of Wilmanns' 'Deutsche Grammatik' (Gotisch, Alt-Mittel- und Neuhochdeutsch). Modern Language Notes x, 34-39.
- 4. 'The Diction and Rime-Technic of Hartman von Aue'. New York and Leipzig, 1896. Pp. 74.
- 5. 'Materials for German Conversation'. New York, 1900. Pp. $\rm v+176$.

- 6. 'Rime-Parallelism in Old High German Verse. Studies in honor of Basil Lanneau Gildersleeve'. Pp. 435-442. Baltimore, 1902.
- 7. 'The Religion of the Teutons', by P. D. Chantepie de la Saussaye, translated from the Dutch. Boston, 1902. Pp. viii + 504.
- 8. Review of W. Kurrelmeyer's 'The historical Development of the Types of the first person plural Imperative in German'. Zeitschrift für deutsche Wortforschung 11, 323-326.
- 'Kinder- und Hausmärchen der Brüder Grimm, selected and edited with an Introduction, Notes and a Vocabulary'. New York, 1903. Pp. 191.
- 10. 'Essentials of German'. New York, 1903. Pp. viii + 222. Second Edition, Revised. New York, 1906. Pp. 279. Third Edition, Revised. New York, 1908. Pp. 287. 'Supplementary Exercises' to the same. New York, 1905. Pp. 47.
- 11. 'Die Harzreise' von Heinrich Heine, edited with Introduction, Notes and Vocabulary. Boston, 1908. Pp. 196.
- 12. 'Notes on Heine' (i-vi), Modern Language Notes xxiii, 25-28 and 39-43.
- 13. Review of Howard and Sturtevant's edition of Gottfried Keller's 'Das Fähnlein der sieben Aufrechten', Modern Language Notes xxiii, 251-252.

DEPARTMENT OF COMPARATIVE PHILOLOGY

GUIDO H. STEMPEL, Associate Professor.

The degree of A.B. in Comparative Philology may be conferred upon students who have a grounding in at least two foreign languages. The major requirement is forty-five hours in this Department, including Courses 1 and 2.

The graduate courses offered will be extended as required. They may be supplemented by certain of the courses listed as undergraduate, as well as by certain courses given in the other language Departments and in History, Social Science (anthropology), Philosophy, and English. The time that can profitably be spent here in graduate study in philology is at present about two years.

The University Library contains about 2,000 volumes of philology. Upwards of fifty languages are represented, and a third of these have their history and cognate relationships fully illustrated. The chief philological periodicals and many of the other serial publications are on the shelves, quite generally in complete files. It may perhaps be said that the student of philology has access to a fairly satisfactory working library.

[5. Comparative Philology of the Classical Languages. An advanced course in the science of language and Indo-European philology. Each student will emphasize the particular language in which he has had special training. Associate Professor Stempel.

Fall, Winter, and Spring terms, M. W. F., at 10:00.

Giles, 'Manual of Comparative Philology for Classical Students'.

Open to students who have passed in Courses 2 and 3, and in thirty hours of language, and to advanced students in Latin or Greek.]

Not given in 1909-10.

4. Gothic. Grammar and reading; phonology of the early Germanic languages. Associate Professor Stempel.

Fall, Winter, and Spring terms, T. Th., at 10:00.

Wright, 'Primer of the Gothic Language'.

Open to students who have passed in Course 2 and in thirty hours of language, and to others at the option of the instructor.

Given every third year; see Courses 9 and 10.

[9. Old High German. Elements of the grammar, reading of selected texts, study of dialectal divergence. The method will be both comparative and historical. Associate Professor Stempel.

Fall, Winter, and Spring terms, T. Th., at 10:00.

Wright, 'Old High German Primer'; Braune, 'Althochdeutsche Grammatik'; Braune, 'Althochdeutsches Lesebuch'.

Open to students on same conditions as Course 4.]

Not given in 1909-10. Given every third year, following Course 4; see Courses 4 and 10.

[10. Middle High German. (1) Fall term: Elements of the grammar, reading of easy texts, and study of the development of the German language. (2) Winter and Spring terms: Nibelungenlied, with special study of the popular epic. Associate Professor Stempel.

Fall, Winter, and Spring terms, T. Th., at 10:00.

Wright, 'Middle High German Primer'; Paul, 'Mittelhochdeutsche Grammatik'; Robertson, 'Der arme Heinrich'; Zarncke, 'Das Nibelungenlied'.

Open to students on same conditions as Course 4.]

Not given in 1909-10. Given every third year, following Course 9: see Courses 9 and 10.

 Old Norse. Introduction to the language, and the reading of texts that throw light upon the popular literature of England and Germany. Associate Professor Stempel.

Fall, Winter, and Spring terms, M. W. F., at 10:00.

Sweet, 'Icelandic Primer'; selected texts.

Open to students who have passed in fifteen hours of Germanic philology and to others at the option of the instructor.

PUBLICATIONS BY MEMBERS OF THE DEPARTMENT.

GUIDO H. STEMPEL.

- 19. 'An Epoch-Remaking Book'. Review of Edwin Johnson's 'Rise of English Culture'. *In* Dial, XXXVII, pp. 304-6. (Nov. 16, 1904.)
- 20. Review of Scott-Buck's 'Brief English Grammar'. In School Review, XV, pp. 306-7. (Feb., 1907.)
- 21. Review of Thomas R. Lounsbury's 'Standard of Usage in English', and Jacob Zeitlin's 'Accusative with Infinitive Construction in English'. In School Review (in Press).

DEPARTMENT OF ENGLISH

WILL D. HOWE, Professor of English.
CHARLES J. SEMBOWER, Professor of English.
HENRY T. STEPHENSON, Associate Professor of English.
FRANK AYDELOTTE, Associate Professor of English.
*EDWARD P. MORTON, Assistant Professor of English.

Undergraduate students who select the work of this Department for their major subject must take forty-five hours in English and thirty hours of collateral work approved by the Department. Not more than fifteen hours of Public Speaking may be taken as collateral.

At present, two years may be spent with profit in pursuing the work which will lead toward the degree of Doctor of Philosophy. The Library is equipped for research work in several periods, is well provided with the principal periodicals and with the publications of most of the learned societies. The instructors of the Department will gladly direct competent advanced students in lines of investigation and research.

- Metrics. A study of modern English meter.
 Fall, Winter, and Spring terms, T. Th.
- 33. Literary Criticism. A study of the history and principles of literary criticism.
 Fall, Winter, and Spring terms, two hours each week.
- 35. Composition Seminary. A course in writing restricted to those who have passed with distinction in Course 15. Professor Howe, Associate Professors Sembower, Stephenson.
- 12a. Materials of Prose Fiction, Research course, Professor Howe.

Fall, Winter, and Spring terms, two hours each week.

^{*}Absent on leave from August 1, 1908.

- 12b. Seventeenth Century Literature. Research course. Associate Professor Sembower.
 - Fall, Winter, and Spring terms, two hours each week.
- 12c. Chaucer. Research course. Associate Professor Aydelotte. Fall, Winter, and Spring terms, two hours each week.
- 48. Courses of special study. The Department will encourage special study in the literature of any period or in topics which may be pursued with profit.

DEPARTMENT OF HISTORY AND POLITICAL SCIENCE

James A. Woodburn, Professor of American History and Politics. Samuel B. Harding, Professor of European History.

Amos S. Hershey, Professor of Political Science and International Law.

WILLIAM SPENCE ROBERTSON, Acting Professor of American History (1909).

*Thomas L. Harris, Instructor.

Solon J. Buck, Instructor.

Undergraduates selecting the work of this Department for their major subject must take forty-five hours in History and thirty hours collateral work approved by the Department. The latter must include Course 1 of the Department of Economics, and may include a maximum of fifteen hours selected from the courses in Political Science offered by this Department.

The Department is prepared to offer research work leading to the A.M. and Ph.D. in the following fields: American Colonial History, the American Civil War and Reconstruction, English History in the Seventeenth and Nineteenth Centuries, the French Revolution, Diplomatic History, Political Philosophy, and International Law. In

^{*}Absent on leave, 1909-10

each of these fields good library collections are already at hand, to which constant additions are being made.

 Renaissance and Reformation, 1300-1555. Lectures, text-book study, collateral reading, and preparation of papers. The conciliar movement for reform; the Renaissance in Italy and Germany; the Protestant revolution in Germany, Switzerland, and France; the Council of Trent and the Counter Reformation; the religious peace of Augsburg. Professor HARDING.

Fall, Winter, and Spring terms, M. W. F., at 11:00. Should be accompanied by Fine Arts 4, T. Th., at 11:00.

13. France in the Middle Ages. A study of the institutions of mediæval France, and of the processes whereby the feudal type of society was transformed into the modern state. Lectures, collateral reading, and reports on assigned topics. Professor Harding.

Fall and Winter terms, T. Th., at 11:00.

 Historical Method. The principles of historical investigation, with some practice in the use of sources and the preparation of papers. Professor HARDING.

Spring term, T. Th., at 9:00.

Langlois and Seignobos's 'Introduction to the Study of History'.

American Diplomatic History, 1776-1876. A study of the subjects of chief importance in the international relations of the United States from the time of the Declaration of Independence. Mr. Buck.

Fall, Winter, and Spring terms, T. Th., at 8:00.

28. American Political Discussions. A study of some of the more notable contributions to political and constitutional controversies in the national period of American history. Designed to introduce the student to a first-hand knowledge of the materials relating to the leading issues in our national development. Professor Woodburn.

Fall, Winter, and Spring terms, T. Th., at 9:00.

Presupposes Course 18 or its equivalent.

20a. Seminary in English History. Individual research work, under the guidance of the instructor, on some subject connected with modern English history. The results of the investigations are presented from time to time as reports and are finally embodied in papers in form suitable for publication, of which a copy must be left with the Seminary. Professor HARDING.

Fall, Winter, and Spring terms. Hours for individual conference to be arranged.

20c. Seminary in American Constitutional and Political History. In 1908-09 the period of the Civil War will be studied. Study of the sources, reports of investigations, and thesis work. Professor Woodburn.

Fall, Winter, and Spring terms, M., at $4\,:\!00$ to $5\,:\!30$. Open to advanced students and graduates.

24. History of Political Ideas and Theory of the State. A study of the nature, origin, form, and functions of the state, together with an analysis of the structure and province of government. A brief sketch or outline of the history of political ideas or theories will also be given. Professor Hershey.

Spring term, M. W. F., at 11:00.

Open to students who have passed in Course 23, or have had the equivalent of two years' work in History, Law, or Economics.

Pollock, 'History of Political Ideas'; Leacock, 'Elements of Political Science,'

25. Public International Law. Subjects of international law; rights and duties of states in their normal relations; intervention; principles governing states in time of war; the law of neutrality; territorial property and jurisdiction; territorial waters; high seas; contraband; blockade, etc. Text-book work, lectures, and the study of cases and illustrations drawn, from the Russo-Japanese War. Intended primarily for the Third year class in the School of Law, and Seniors and graduate students in history. Professor Hershey.

Fall, Winter, and Spring terms, T. Th., at an hour to be appointed.

Lawrence, 'International Law'; Hershey, 'The International Law and Diplomacy of the Russo-Japanese War'.

20d. Seminary in International Law and Diplomacy. Research work and the special study of important topics, more especially of present-day problems. During recent years such subjects were selected as the Alabama Claims, the Panama Affair, the causes of the Russo-Japanese War, the 'Open Door' policy in China, and the genesis of the Monroe Doctrine. Professor Hershex.

Fall, Winter, and Spring terms, at hours to be appointed. Open to Seniors and graduate students.

PUBLICATIONS BY MEMBERS OF THE DEPARTMENT

Solon Justus Buck, A. M.

'The Settlement of Oklahoma'. In Transactions of the Wisconsin Academy of Sciences, Arts, and Letters, XV, Pt. II (1907).

Amos Shartle Hershey, Ph.D.

- 10. Series of eight articles on 'Some Questions of International Law Arising from the Russo-Japanese War'. In Green Bag. XVI (May to December, 1904).
- 11. 'The Relations of England and the United States as Affected by the Far-Eastern Question'. *In* Proceedings of the American Political Science Association for 1905, pp. 59-72.
- 'What Justifies Intervention in War?' In The Review of Reviews, XXXI (1905), 199-201.
- Review of Asakawa's 'Russo-Japanese Conflict', In Yale Review, XIV (May, 1905), pp. 93-94.
- Review of Maxey's 'International Law, with Illustrated Cases'. In American Political Science Review, I (1906), 148-151.
- 15. 'The International Law and Diplomacy of the Russo-Japanese War'. Pp. XII, 394. New York, 1906.
- 'The Coming Peace Conference at the Hague'. In New York Independent, LXI (1906). 607-14.
- 17. 'The Calvo and Drago Doctrines'. In American Journal of International Law, I, 24-45 (1907).

- 18. 'The Japanese School Question and the Treaty-Making Power'. In American Political Science Review, I (1907), 393-409.
- 'The Forcible Collection of Contract Debts'. In Proceedings of the American Society of International Law for 1907, pp. 124-133.
- 'Why the Nations Cannot Disarm', In Reader Magazine, X, 339-343 (1907).
- 21. 'An International Prize Court'. In Green Bag, XIX, (1907).
- Review of Moore's 'International Law Digest'. In Columbia Law Review, VII (1907), 222-24.
- 23. Review of Latane's 'America as a World Power'. *In American Historical Review*, XIII (1908), pp. 625-26.
- 24. Reviews of Ariga's 'La Guerre Russo-Japonaise au Point de Vue Continental et le Droit International'; Takahashi's 'International Law as Applied to the Russo-Japanese War'; and Rey's 'La Guerre Russo-Japonaise au Point de Vue de Droit International'. In American Journal of International Law, II (1908), pp. 942-951.
- 25. 'The Convention for the Peaceful Adjustment of International Differences'. *In American Journal of International Law, II* (1909), 29-49.
- 26. 'Les Doctrines de Calvo et de Drago'. French Translation of 'The Calvo and Drago Doctrines'. *In* 'La Doctrine de Drago', by H. A. Moulin, Paris, 1908. Pp. 173-202.
- 27. 'The United States as a Peace Power'. In American Historical Review, XIII, pp. 449, and in The World of To-Day, December, 1908, pp. 1254-57.
- 28. 'Germany—The Main Obstacle to World's Peace'. In New York Independent, LXVI, 1071-76 (1909).
- Review of Coolidge's 'United States as a World Power'. In American Historical Review, XIV (1909), pp. 372-74.
- 30. Review of Hull's 'Two Hague Conferences and Their Contributions to International Law'. *In* American Historical Review XIV (1909), 384-85.
- Review of Campbell's 'Neutral Rights and Obligations on the Anglo-Boer War'. In American Political Science Review, 111 (1909), pp. 114-116.
- Review of Moulin's 'La Doctrine de Drago', In American Journal of International Law for July, 1909.

WILLIAM SPENCE ROBERTSON, Ph.D.

- ''Francisco de Miranda and the Revolutionizing of Spanish America'. In Report of the American Historical Association for 1907.
- SAMUEL BANNISTER HARDING, Ph.D.
- 14. Review of William B. Weeden's 'War Government, Federal and State, in Massachusetts, New York, Pennsylvania, and Indiana, 1860-1865'. *In* American Historical Review, XII, pp. 408-410 (Jan., 1907).
- 15. 'Select Orations Illustrating American Political History'. Selected and edited. Indianapolis, 1908. Pp. XII, 507.
- 16. 'Lincoln selections, comprising the first Lincoln-Douglas debate, first and second inaugurals, Gettysburg address'. Edited, with introductions. Indianapolis, 1909. Pp. 56.
- 17. 'The Story of England: an elementary history of England, for use in sixth and seventh grades'. Chicago, 1909. Illustrations and maps. Pp. about 350. (In press.)

DEPARTMENT OF ECONOMICS AND SOCIAL SCIENCE

ULYSSES G. WEATHERLY, Professor of Economics and Social Science. WILLIAM A. RAWLES, Professor of Political Economy.

Undergraduates selecting Economics and Social Science as their major subject are required to take nine terms of daily work (forty-five hours) in the Department. Of the elective work in other Departmets at least three terms should be in History and Political Science, and it is strongly urged that one course of this work be taken in the Freshman year, before the work in Economics is begun.

The courses in the Department fall into two groups, adjusted to the needs of those students whose interest lies primarily in the field of Economics or of those who wish to work chiefly in Sociology. The graduate work in both lines centers in Courses 8 and 8a. The Department Li-

brary is equipped with full sets of the most important public documents, both state and national, and has complete sets of most of the American, English, French and German economic periodicals. Advanced students have direct access to these materials, and also to the special collections relating to charitable and correctional institutions. The Department is affiliated with the Charity Organization Society of Indianapolis, and through this means properly qualified students are enabled to come into direct contact with the social and economic problems of that city. Constant use is also made of the statistical materials in the various departments of the State government, and also in the State Library.

The following courses are designed to furnish the work for the Master's Degree. In certain cases a second year of graduate study may be taken with advantage.

- 6. Money, Banking, and the Money Market. (1) Fall term: Money. General monetary principles and such special subjects as bimetallism, the standard of deferred payments, and the present monetary situation in the United States. (2) Winter term: Banking. History and theory of Banking and credit operations, followed by a study of the banking systems of the leading foreign states, and of the recent proposals of banking reforms in the United States. (3) Spring term: The Money Market. A study of the rates of discount and exchange (domestic and foreign), the functions of bill brokers, international payments, financial panics and crises, financial aspects of stock and produce exchanges, and London and New York as centers of financial operations, Lectures, text-heoks, and special reports. Professor RAWLES, Fall, Winter, and Spring terms, T. Th., at S:00.
- Public Finance. A study of the revenues and expenditures of the various political units, local, state, and national, and the leading features of financial administration, taxation, and

public debts. A detailed study will be made of the tax system of Indiana. The financial history of the United States, with especial attention to the currency, taxation, and banking institutions. Lectures, text-books and collateral readings. Professor RAWLES.

Fall, Winter, and Spring terms, M. W. F., at 8:00.

 Transportation. An historical survey of the means and methods of transportation, followed by a study of the economic and social bearings of the present transportation question. Professor RAWLES.

Spring term, M. W. F., at 9:00.

Ethnology. The origin and antiquity of man; physical characteristics of race as a basis of race classification; social and psychic characteristics in relation to material civilization; race geography. Professor Weatherly.

Fall term, T. Th., at 10:00.

21. Comparative Sociology: The problem of the family. Historical evolution of the family; types of marriage and of kinship; present status of opinion as to the primitive family; the divorce problem, and the economic and social position of woman. Professor Weatherly.

Winter term, T. Th., at 10:00.

23. Demography of the United States. Racial ingredients of the national population; problems of race contact and assimilation; special problems connected with immigration and naturalization; the negro problem; the movements of population. Professor Weatherly.

Spring term, T .Th., at 10:00.

4a. Social Pathology: Pauperism and charities. A general introduction to the study of the degenerate classes; the causes of dependence; a comparative study of modern modes of dealing with the defective and dependent classes; charity organization and the most recent developments in preventive philanthropy. Professor Weatherly.

Fall term, M. W. F., at 10:00.

4b. Social Pathology: Crime and penology. Nature and causes of crime; an examination of criminal anthropology; the historical development of penology; the reformatory system, the juvenile court and probation system; the leading problems of criminal jurisprudence. The class will make a two days' visit to the benevolent and penal institutions at Indianapolis. Professor Weatherny

Winter term, M. W. F., at 10:00.

Open to third and fourth year students in Economics, History, Philosophy, and Law.

4c. Social Pathology: Special problems. In 1908-09 the subject of the course will be the liquor problem and social betterment. Other topics to be taken up from year to year will be industrial betterment, and the special questions of municipal sociology. Professor Weatherly.

Spring term, M. W. F., at 10:00.

10. Socialism and Social Reform. A historical study of ntopian social philosophy and of the growth of scientific socialism; the origin and present position of Marxian socialism; American communistic experiments and movements for radical social reform. Professor Weatherly.

Fall term, T. Th., at 11:00.

16. Industrial Society. An examination of certain recent theories of distribution with special reference to their bearing on the social aspects of industry; in the study of the questions at issue between capital and labor emphasis is laid on the growing recognition of society's paramount interest. Professor Weatherly

Winter term, T. Th., at 11:00.

 General Sociology. A summary of social forces and an attempt to formulate certain principles of social action; a careful analysis and criticism is made of those trends of sociological speculation which give most promise of being permanently fruitful. Professor Weatherly.

Spring term, T. Th., at 11:00.

- 8. Seminary in Economics and Sociology. Designed for advanced students who have shown the ability to undertake individual research. The subjects for investigation may be taken from the field of either Economics or Sociology, but it is intended that they shall have some degree of unity. Considerable attention is given to training in statistical methods. Each member is expected to prepare a thesis exhibiting the results of original research. Professors Weatherly and Rawles. Fall, Winter and Spring terms, two hours a week, at an hour to be appointed.
- Sa. Research. Special investigations upon economic or sociological subjects, directed toward the preparation of theses for the Master's degree. Hours and credit by individual arrangement.

PUBLICATIONS BY MEMBERS OF THE DEPARTMENT

ULYSSES GRANT WEATHERLY.

- 12. 'Outlines of sociology'. Indianapolis, 1906. Pp. 34.
- 'Babeuf's place in the history of socialism', In Papers of the Amer. Econ. Assoc., Third Series, Vol. VIII, No. 1, pp. 113-124.
- 14. "Training for social workers". In Indiana Bull. of Char. and Corr. June, 1907, pp. 178-180.
- 15. 'The juvenile delinquent'. In 'The Teachers' Journal, November, 1907, pp. 261-266.
- Review of Karl Lamprecht's 'Deutsche Geschichte, siebenter Baud, erste Haelfte'. In Amer. Hist. Rev. XI, pp. 653-654. (April, 1906.)
- 17. Review of Karl Lamprecht's 'Deutsche Geschichte, neunter Band'. In Amer. Hist. Rev. XIII, pp. 351-353. (Jan., 1908.)
- Review of Karl Lamprecht's 'Deutsche Geschichte, zehuter Band'. In Amer. Hist. Rev. XIII, pp. 872-874. (July, 1908.)
- Review of William B. Guthrie's 'Socialism before the French revolution: a history'. In Amer. Hist. Rev. XIII, pp. 346-347. (Jan., 1908.)
- 20. Review of William Graham Summer's 'Folkways: a study of the sociological importance of usages, manners, customs, mores, and morals'. *In* Econ. Bull. I. pp. 58-60. (April, 1908.)

- 21. Review of Lewis H. Morgan's 'Ancient society'. In Econ. Bull. I, pp. 65-66. (April, 1908.)
- Review of William I. Thomas's 'Sex and society', In Econ. Bull. I, 155-157. (June, 1908.)
- Review of Hutton Webster's 'Primitive secret societies'. In Econ. Bull. I, pp. 151-154. (June, 1908.)
- 24. Review of Jerome Dowd's 'The negro races: a sociological study, Vol. I'. In Econ. Bull. I, pp. 234-235. (Sept., 1908.)
- 25. Review of Maurice Parmelee's 'The principles of anthropology and sociology in their relations to criminal procedure'. In Econ. Bull. I, pp. 344-345. (Dec., 1908.)
- 26. 'Race friction between blacks and whites in the United States'. In Amer. Jour. Sociol. XIII, pp. 823-825. (May, 1908.)
 - 27. The same, in Pub. Amer. Sociol. Soc., Vol. II, pp. 93-95.
- 28. 'How does the access of women to industrial occupations react on the family'? In Pub. Amer. Sociol. Soc., Vol. III, pp. 124-136.
- 29. Review of Alfred Holt Stone's 'Studies in the American race Problem', In Econ. Bull. II, 60-62. (April, 1909.)
- 30. Review of W. E. Burghardt Du Bois' 'Economic co-operation among negro Americans'. In Econ. Bull. II, 62-64. (April, 1909.)
- 31. Joint editor of the Economic Bulletin, in charge of the department of Anthropology and Ethnography.
 - 32. Advising editor of the American Journal of Sociology.

DEPARTMENT OF PHILOSOPHY

ERNEST H. LINDLEY, Professor of Philosophy and Psychology. WARNER FITE, Professor of Philosophy.

WILLIAM L. BRYAN, Lecturer on Ethics.

———, Director of the Psychological Laboratory.

For students who take their major subject in this Department, the required work consists of Courses 1, 2, 3, 27, 4a, and Course 5 of the Department of Anatomy. Students desiring to give their chief attention to general philosophy may substitute Course 6a or 6b for Anatomy 5.

The psychological laboratory occupies four large and

twelve small rooms, of special construction, in Science

Hall. Among those designed for special uses are a large dark-room for experiments on vision, equipped with large iris-diaphragm, arc-light, and heliostat attachments; a sound-proof room for the study of minimal auditory sensations: three small double rooms providing convenient isolation of subjects during experiments on reaction-time, circulation, etc. The laboratory is supplied throughout with water, gas, and electric light and power, and has apparatus for both practice and research courses. Besides the usual outfit for the study of sensation and perception, such as is required by Sanford's 'Manual', the laboratory is equipped with the following generally useful or special pieces: (1) For reaction-time experiments: the Hipp chronoscope, and ten pendulum chronoscopes,* together with the necessary electric keys, commutators, drop machines, sound keys, etc.; also two clocks* for giving various intervals in experiments by the continuous method. (2) For graphic work: the Marey and the Ludwig kymographs, a continuous paper kymograph, two simple spring-kymographs, an electric fork, the Kreonecker interrupter, the Jacques interval watch, together with the necessary receiving, transmitting, and writing apparatus: the Mosso plethysmograph, a pneumograph, the Verdin radial and carotid sphygmographs, the Runne sphygmograph, and a constant electric motor. (3) For the study of movement: myographs, a tapping machine,* and a general ergograph.* (4) For memory and association: a compound interrupter,* with drum and escapement, for experiments according to the Ebbinghaus method, together with the necessary syllable series, etc., and a large set of interference cards. (5) Miscellaneous: apparatus

^{*}Designed and made in the Department.

for testing the competitive instinct;* instrument for testing the force and direction of movement simultaneously.*

(6) An aviary, an incubator and brooder, quarters for small animals, artificial nests for ants, etc., and other facilities for the study of comparative psychology.

The workshop of the psychological laboratory is equipped with two photographic dark-rooms, an electric motor, a Reed lathe with screw-cutting and gear-cutting attachments, and the necessary tools for work in wood and metal; it is used both for repairing old and for constructing new apparatus.

In addition to the apparatus in experimental psychology, the Department possesses a laboratory for the study of neurology. This includes a large number of charts, a series of models of the nervous system, including Auzoux models of brain, eye, and ear; Ziegler models of the embryology of the human brain; a series of human and animal brains; dissecting outfits; microtomes, microscopes, and other appliances necessary to the study of the structure and functions of the nervous system.

The following are the graduate courses of the Department.

 Modern Idealism. An advanced study of metaphysics, based upon Royce's 'The World and the Individual' as a text. Professor Fite.

Fall, Winter, and Spring terms, T. Th., at 10:00.

Open to students who have taken Courses 1, 2, and 3, or their equivalent.

 Seminary in Philosophy. A course designed to aid advanced students in the investigation of philosophical problems. The subject for 1908-09 will be problems of contemporary philosophy. Professor Lindley.

Fall, Winter, and Spring terms, two honrs a week.

Open to students who have had sufficient preparation.

^{*}Designed and made in the Department.

8. Psychological Research. Work arranged with individual students. Professor Lindley.

Fall, Winter, and Spring terms, at hours to be arranged.

PUBLICATIONS BY MEMBERS OF THE DEPARTMENT

ERNEST HIRAM LINDLEY.

- Review of Judd's 'Psychology: General Introduction and Laboratory Manual'. Journal Philosophy, Psychology and Scientific Methods, IV, 26.
- 12. 'Relations of Ethics to Philosophy and Psychology'. Proc. Am. Psych. Assn., 1907-08. Psych. Review, V.

JOHN P. PORTER.

'A preliminary study of the English sparrow'. Contributions from the Psychological laboratory of Indiana University. Am. Jour. Psych. XV.

F. O. Beck.

'Prayer: A study in its History and Psychology'. Am. Jonr. Religious Psychology and Education II.

WARNER FITE.

- 'The priority of inner experience'. In Philos. Rev. IV, pp. 129-142. (March, 1895.)
- 2. Review of Rehmke's 'Lehrbuch der allgemeinen Psychologie'. In Philos. Rev. V, pp. 412-417. (July, 1896.)
- 3. 'Professor Patten's psychological doctrines'. (A criticism of Simon N. Patten's 'Development of English Thought.) In Jour. Pal. Econ. III, pp. 384-391. (June, 1899.)
- 4. 'The Associational conception of experience'. In Philos. Rev., IX, pp. 168-292. (May, 1900.)
- 'Contiguity and Similarity'. In Philos. Rev., IX, pp. 613-629. (November, 1900.)
- 6. (Art, Industry and Science: a suggestion toward a pyschological theory of art.) In Psy. Rev., VIII, pp. 128-144. (March, 1901.)
- 7. 'The monaural localization of sound'. (Joint author with J. R. Angell.) In Psy. Rev., VIII, pp. 225-246. (May, 1901.)
- 8. 'Further observations on the monaural localization of sound'. (Joint author with J. R. Angell.) In Psy. Rev., VIII, pp. 449, 458. (September, 1901.)

- 'An introductory study of ethics'. New York and London, 1903. Pp. xi, 374.
- "The Place of Pleasure and Pain in the functional psychology". In Psy. Rev., X, pp. 633-644. (November, 1903.)
- 'Herbert Spencer as a philosopher'. In Jour. Philos., Psy., and Sci. Meth., I, pp. 288-293. (May, 1904.)
- "The logic of the color-element theory". In Psy. Bull. I, 455-464. (December, 1904.)
- 13. "The experience-philosophy'. In Philos. Rev., XV, pp. 1-16. (January, 1906.)
- 14. 'The exaggeration of the social'. In Jour. Philos., Psy., and Sci. Meth., IV, pp. 393-396. July, 1907.)
- 'The theory of democracy'. In Int. Jour. Ethics, XVIII, pp. 1-18. (October, 1907.)
- 'The agent and the observer'. In Philos, Rev., XVII, pp. 489-506. (September, 1908.)
- 17. Review of Jonas Cohn's 'Die Voraussetzungen und Ziele des Erkennens'. In Philos. Rev., XVIII. (May, 1909.) In press.
- Nineteen other reviews of books in Philos, Rev., Psy. Rev. and Am. Jour, Theol.

DEPARTMENT OF FINE ARTS

Alfred M. Brooks, Professor. Robert E. Burke, Instructor.

This Department is well equipped for graduate work. In addition to its collections of photographs, casts, and other reproductions of works of art, it possesses many engravings, and some valuable drawings by old and modern masters. These collections are being increased constantly, as are the books upon Fine Arts in the Library.

PUBLICATIONS BY MEMBERS OF THE DEPARTMENT

Alfred Mansfield Brooks, A.M.

- 'Architecture: Greek, Roman, Byzantine, Romanesque, and Gothic'. Chicago, 1898.
 - 2. 'The Newell Fortune', London, 1906.
 - 3. 'Somes House', London, 1909.

DEPARTMENT OF MATHEMATICS

Schuyler C. Davisson, Professor, David A. Rothrock, Professor, Ulysses S. Hanna, Associate Professor.

The graduate courses at present offered in the Department require about three years for their completion.

The Library of the Department of Mathematics, consisting of about 2,000 bound volumes, is located in Room 26, Wylie Hall. The Library is open from 8:00 a.m. to 10:00 p.m. for use by students pursuing advanced work in mathematics. The collection of mathematical books consists of the more important English, French, and German texts, the collected works of Abel, Bernoulli, Cauchy, Cayley, Clifford, DeMorgan, Gauss, Jacobi, Lagrange, Lie, Möbius, Riemann, Schwartz, Smith, Steiner, and Weierstrass, together with the following sets of periodicals:

Acta Mathematics. Stockholm, Berlin, Paris. 1882 to date. American Journal of Mathematics. Baltimore. 1878 to date.

American Mathematical Monthly, Springfield, Mo. 1894 to date. Analyst (The). Des Moines, Ia. 1874-1883, Complete.

Annals of Mathematics. Charlottesville, Va., and Cambridge, Mass, 1884 to date.

Annales scientifiques de l'Ecole Normale Supérieur, Paris. (Current numbers.)

Archiv für Mathematik und Physik. Leipzig. 1841 to date.

Bulletin de la Société Mathèmatique de France. Paris. 1873 to date. Bulletin of the American Mathematical Society. New York. 1894 to date.

Bulletin of the New York Mathematical Society. New York, 1891-1894. Complete.

Cambridge Mathematical Journal, Cambridge, 1837-1845, Complete.

Cambridge and Dublin Mathematical Journal. Cambridge, 1846-1854. Complete. Educational Times (Mathematical Reprints from the). London. 1863 to date.

Giornale di Matematiche. Naples. (Current numbers.)

Jahresbericht der deutschen Mathematiker Vereinigung. Leipzig, 1890 to date,

Jahrbuch über die Fortschritte der Mathematik. Berlin. 1869 to date.

Journal de l'Ecole Polytechnique. Paris. (Current numbers.)

Journal de Mathématiques pures et appliqués (Lionville). Paris. 1836 to date.

Journal für die reine und angewandte Mathematik (Crelle). Berlin. 1826 to date.

L'Enseignement Mathématique. Paris. (Current numbers.)

Mathematical Monthly (The). Cambridge, Mass. 1859-1861. Complete.

Mathematical Magazine. Washington. 1882-1884.

Mathematical Gazette. London, 1901 to date.

Mathematical Messenger (The). 1887-1894. Complete.

Mathematical Review, Worcester, 1896-1897, Complete.

Mathematical Visitor. 1877-1883. Complete.

Mathematische Annalen. Leipzig. 1869 to date.

Mathesis. Ghent. 1881 to date.

Messenger of Mathematics (The Oxford, Cambridge and Dublin). Cambridge. 1862-1871. Complete,

Messenger of Mathematics (The), London and Cambridge, 1872 to date.

Monatshefte für Mathematik und Physik, Vienna. (Current numbers.)

Nachrichten von der Königlischen Gesellschaft der Wissenschaften zu Göttingen. Göttingen. 1899 to date.

Proceedings of the Edinburgh Mathematical Society, Edinburgh, 1883 to date.

Proceedings of the London Mathematical Society, London, 1865 to date,

Quarterly Journal of Mathematics, Pure and Applied, London, 1857 to date.

Rendiconti del Circolo Matematico di Palermo, Palermo, 1884 to date. Revue Semestrielle des Publications Mathématiques, Amsterdam, 1893 to date.

Transactions of the American Mathematical Society, New York, 1900 to date,

In addition to the above list of periodicals and complete sets belonging to the Mathematical library, the general University library receives a number of periodicals partly devoted to mathematics. Among these may be mentioned the following: 'Les Comptes Rendus de l'Académie des Sciences', 'The Philosophical Magazine', 'The Transactions of the Royal Society'.

The following courses for graduate students will be given at hours to be arranged:

- 20. Mathematical Reading and Research, Professors Davisson, and Rothrock, Associate Professor Hanna.
- 30. Theory of Surfaces. Lectures and reports upon the general theory of surfaces and twisted curves. Singularities of surfaces, asymptotic curves, lines of curvature, geodesic lines. Differential geometry. Six hours' credit. Professor Davisson.

1909-1910, M. W. F.

21. Functions of a Complex Variable. The fundamental operations, conformal representation, stereographic projection and mapping upon the Riemann sphere, series developments. Cauchy's and related theorems, many-valued functions, Riemann surfaces. Lectures and reports. Professor ROTH-ROCK.

Fall and Winter terms, 1909-10, six hours, and Spring and Summer, 1911, six hours.

Prerequisite. Mathematics 10, 13.

24. Functions of Real Variables. An introduction to the theory of functions of real variables. Assemblages, limits, derivatives, definite integrals. Professor Rothrock.

Spring and Summer terms, 1910, six hours.

Prerequisite, Mathematics 10. 13, 21.

15. Modern Analytical Geometry. A study of point and line coordinates, duality, anharmonic ratios, nature of co-ordinate systems, circular points, and the line at infinity. Lectures, assigned reading, and exercises. Four hours' credit, Professor Davisson.

Summer, 1910.

38. Fourier's Series and Fourier's Integrals. A study of the more important partial differential equations of mathematical physics, the development of functions into sine and cosine series, Fourier's series and Fourier's integrals, and applications of the latter two in the solution of problems in physics. Four hours' credit. Professor Davisson.

Fall and Winter, T. Th., 1910-1911.

 Fundamental Concepts of Mathematics. A course dealing with the foundations of mathematics. Lectures and reports. Professor Davisson.

Spring, 1911, T. Th.

 Systems of Geometry. An introductory course presenting the fundamental principles of the more important systems of geometry. Professor ROTHROCK.

Fall and Winter terms, 1910-1911, six hours.

- Calculus of Variations. Professor ROTHROCK.
 Spring and Summer terms, 1911, six hours.
- Theory of Numbers. Linear congruences, proofs of the law of quadratic reciprocity, the analytic and geometric theories of forms, etc. Associate Professor Hanna.

Summer term, 1909, five hours' credit; Fall term, 1910, three hours' credit.

 Invariants and Covariants. Fundamental processes for forming invariants; binary forms of the second, third, fourth and higher orders; applications to curves. Associate Professor Hanna.

Fall, Winter, and Spring terms, 1909-1910, six hours' credit.

 Theory of Groups of Substitutions. An elementary course dealing with the fundamental theorems preparatory to Course 40. Associate Professor Hanna.

Winter term, 1910-11, three hours' credit. (Follow Course 32.)

- 40. The Galois Theory of Equations. A continuation of Course 39, both courses based on Bianchi's 'Lezioni sulla Teoria dei Gruppi di Sostituzioni'. Associate Professor Hanna. Spring term, 1910-11, three hours' credit.
- Vector Analysis. A study of the algebraic, differential and integral properties of vectors. Special emphasis will be laid on the physical interpretation and application of vectors. Mr. WILLIAMS.

Three hours, Summer and Fall terms, 1909.

33. Partial Differential Equations. This course deals with various types of partial differential equations that occur in theoretical physics. Mr. Williams.

Six hours, Winter and Spring terms, 1910.

51. Integral Equations. A treatment of the Fredholm Integral Equation with its various applications.

Six hours, Fall and Winter terms, 1910 and 1911.

PUBLICATIONS BY MEMBERS OF THE DEPARTMENT

SCHUYLER COLFAX DAVISSON.

- 2. Review of Halsted's 'Rational Geometry'. In Bulletin American Mathematical Society.
 - 3. 'College Algebra'. In press of Macmillan Company.

DAVID ANDREW ROTHROCK.

- Supplementary Problems to Essentials of Algebra'. (Joint author with R. J. Aley.) New York, 1906, pp. 1-68.
- 'Lectures on Functions of a Complex Variable'. Part I. Lithographed edition by H. Kühler, Munich, 1904.
- 7. 'Concerning Differential Invariants'. In Proc. Indiana Acad. Sci. 1906, pp. 85-94.
- S. 'Plane and Spherical Trigonometry'. To appear 1909 from press of Macmillan Co., N. Y.

ULYSSES SHERMAN HANNA.

- 'The Bitangential of the Quintic'. In Proc. Indiana Acad. Sci. for 1901.
- 2. 'Irrelevant Factors in Bitangentials of Plane Algebraic Curves', In Proc. Indiana Acad. Sci. for 1904.

 'The Equations of Bitangential Curves of the General Plane Quintic and Sextic Curves'. In 'Rendiconti del Circolo Matematico di Palermo'. 1909.

CHARLES HASEMAN.

- 'Anwendung der Theorie der Integralgleichungen auf einige Randwertaufgaben in der Funktionentheorie'. Dissertation, Göttingen, 1907.
- 2. 'Integralgleichungen und Funktionentheorie'. Mathematische Annalen, Vol. 66, 1908, p. 258.

DEPARTMENT OF MECHANICS AND ASTRONOMY

WILBUR A. COGSHALL, Associate Professor of Astronomy. *Vernon A. Suydam, Instructor in Mechanics.

Kirkwood Observatory, completed in 1900, is occupied by the Department. The building contains a library and computing room; a lecture room; dark room; a transit room, in which is a Bamberg universal instrument, a Howard sideral clock, a mean time chronometer, and a chronograph; a dome twenty-six feet in diameter; and a room of the same size immediately below. In the dome is the refracting telescope, of which the 12-inch objective is by Brashear, and the mounting by Warner and Swasey, of Cleveland. The instrument has a focal length of about 15 feet, and is supplied with eyepieces magnifying from 130 to nearly 1,000 diameters; also with polarizing helioscope, diagonal evepiece, and an electrically illuminated micrometer: there are both coarse and fine circles in right ascension and declination, the fine circles having reading microscope and electrical illumination.

The Department has in a separate building, a mounting, designed and built by the Department, that carries

^{*}Absent on leave, 1909-10.

a 4-inch Browning refractor, a 5-inch portrait lens and an 8-inch parabolic mirror, for the photography of comets, nebulæ, etc.

Another building contains a colostat and horizontal telescope. The objective of the telescope has a diameter of 9 inches and a focal length of 64 feet. Both the plane of the colostat and the lens are by Petitdidier, of Chicago.

The Lawrence Fellowship of the Department of Mechanics and Astronomy of Indiana University has been established by Mr. Percival Lowell, of the Lowell Observatory, upon the following terms and conditions:

- 1. The Fellowship shall be known as the Lawrence Fellowship, in remembrance of the donor's mother, and is established in perpetuity, revocable, however, at any time at the will of the founder.
- 2. It shall be annually available and shall cover the college calendar year, that is from commencement to commencement of the same.
- 3. The applicant shall be appointed by the Department, the donor reserving the right of final passing upon the suitability of the candidate so presented.
- 4. (A) The Fellow shall be given time and opportunity for an original thesis on some astronomical subject looking to the taking of a Master's degree, the nature of which shall be decided by the Director and the Fellow. (B) But the Fellow shall be expected to give general assistance in the observatory's work during the period of his Fellowship.
- 5. The Fellowship shall pay \$600 and the Fellow's traveling expenses to and from the Observatory at Flagstaff, Ariz.; and a furnished room at the Observatory shall be free to the Fellow's use.

The Department receives telegraphic bulletins of discoveries made at American and European observatories.

 Theoretical Astronomy. Integration of equations of motion; computation of orbits and ephemerides. Associate Professor Cogshall.

Fall term. Hours and credit to be arranged with each student. Open to students who have passed in Mathematics 7.

 Research. A limited number of students will be permitted to undertake research work under the supervision of the Department. The equipment is best suited for work in astronomy of precision and celestial photography. Associate Professor Cosshall.

Fall, Winter and Spring terms. Hours and credit arranged with each student.

 Orbits of Spectroscopic Binaries. A discussion of the methods of Rambault, Lehmann-Filhes, and others for the determination of these orbits. Associate Professor Cogshall. Winter term, T. Th., at 2:00.

 Celestial Mechanics, An introductory course, Associate Professor Cogshall.

Spring term, M. W. F., at 11:00.

Open to students who have passed in Course 7.

 Theoretical Mechanics. Lectures and recitation from text-book, Geometry of motion; linear, plane and solid kinematics; kinetics of a particle and of free and rigid bodies; motion of a variable system. Mr. ———.

Fall and Winter terms, M. W. F., at 9:00.

Zeiwet, 'Theoretical Mechanics'.

8a. Rigid Dynamics. A course intended for students who have completed Mechanics 7 and 8. Discussion of laws of motion, work and energy, oscillations and cyclic motions, dynamics of rigid and deformable bodies, hydrodynamics. Mr. ———.

Fall term, T. Th., at hours to be arranged.

Webster, 'The Dynamics of Particles and of Rigid, Elastic and Fluid Bodies'.

Open to Seniors and graduates who have passed in Mathematics 11, 10, and 13.

DEPARTMENT OF PHYSICS

ARTHUR L. FOLEY, Professor of Physics, ROLLA R. RAMSEY, Associate Professor of Physics,

The Department offers a full course leading to the degree of Ph.D.

The Department is located in Science Hall. The lower half of this building was planned to meet the special needs of the Department, and it embodies the most advanced ideas in physical laboratory construction. The location of the building insures freedom from vibration; the construction is massive and thoroughly fireproof. On the basement floor there are a constant temperature room, a large dynamo laboratory, a manual training laboratory, a drawing room, two research laboratories and two storerooms. The first floor is occupied by the office of the Department, the departmental library, a shop room, an apparatus room, an advanced electrical laboratory, two photometric laboratories, a spectroscopic and photographic laboratory, a standardizing laboratory, a chemical and battery room, a laboratory for advanced work in heat, two research laboratories, five developing rooms, and the elementary laboratories. The latter comprise five rooms —a large room devoted to general practice, and four small rooms for work in sound and light. The south wing of the second floor contains the lecture room, an apparatus and preparation room, and a class room. The lecture room has an elevated floor and is seated with tablet-arm opera chairs. It is provided with automatic blinds, screens, and boards, all under the immediate control of the lecturer. The lecture table is built in three sections, and the plumbing and wiring are arranged so that one, two, or three sections may be used at a time. At the table

the lecturer has battery and dynamo currents (direct and alternating,—one, two, and three phase), dial rheostats. voltmeters, ammeters, electric motors, calcium and electric lanterns, projectoscope, low and high resistance projecting galvanometers, water, gas, compressed air, exhaust cocks, etc. All the laboratories are supplied with water, gas, and electricity. The basement floors are of concrete. There are fifteen large masonry piers and more than three hundred lineal feet of six-inch stone wall shelves. The chemical and battery room has a fume hood and a cement floor. All the developing rooms have both gas and electric ruby lights, tile shelves, and lockers. Thirteen rooms are provided with blinds for making them light tight. The smaller shop room contains a cabinet-maker's bench, a wood trimmer, two screw-cutting lathes, a shaper, a grinder, and wood and metal working tools. This shop is for the repair and construction of physical apparatus. The larger shop is equipped with cabinet-maker's benches, power saws, grinders, wood and metal working lathes, forges, and the tools required for the shop work outlined under Courses 17, 27, 28, and 29. The dynamo room in Science Hall is equipped with generators and motors of eight different types, selected to illustrate the essential features of early as well as modern practice. The generators are belted to a line shaft driven by a Lincoln variable speed motor with speed range of one to five. A traveling crane permits the lifting of any machine in position to be connected by a torsion dynamometer to any other machine, and the machines studied both as generators and motors. All the machines are of special construction, the field and armature windings being divided into sections and the terminals brought to separate posts, thus permitting the study of the performance of the machines under widely different conditions. Direct current may be had of any voltage up to eight hundred, and alternating current (one, two, or three phase), of any frequeuey from ten to three hundred, and of any voltage (without transformers) up to six hundred. The voltage range is still further increased by transformers of various sizes having both primary and secondary coils in three sections with separate terminals for each section. A large dynamo laboratory is provided in a separate building. It is equipped with three single engines, one of ten, one of forty, and one of one hundred fifty horsepower, one compound engine of one hundred twenty-five horsepower, and four generators, respectively of twenty, twenty, eighty, and one hundred kilowatts capacity. The laboratory is well equipped with voltmeters, ammeters, wattmeters, dynamometers, rheostats, and other instruments for heavy currents; also with delicate instruments for exact measurements.

The supply of apparatus for the presentation of courses in modern experimental physics is fairly complete. The equipment and facilities for work have been largely increased during the past three years, especially in the way of delicate instruments and accurate standards for advanced study.

The Library of the Department of Physics contains about six hundred volumes, exclusive of sets of several journals. The following magazines are on file: 'Annalen der Physik', 'Annales de Chemie et de Physique', 'Beiblätter zu den Annalen der Physik', 'Physikalische Zeitschrift', 'The Electrical World and Engineer', 'The Electrician' (London), 'Journal de Physique', 'The Philosoph-

ical Magazine', 'The Physical Review', 'The Proceedings of the Physical Society of London', 'The Proceedings of the Royal Society', 'Le Radium', 'School Science and Mathematics', 'Science Abstracts' (A and B), 'Scientific American and Supplement', 'The Western Electrician', 'Cassier's Magazine', and 'The Manual Training Magazine'. Students have access also to the journals on file in the general library, and in the libraries of other Departments. Of these may be named: 'The American Journal of Science', 'The Astrophysical Journal', 'The Engineering and Mining Journal', 'The Engineering Magazine', 'Nature', 'Comptes Rendus', and 'Science'.

12. The Electromagnetic Theory of Light, Assistant Professor

Fall, Winter and Spring terms, T. Th., at 9:00. Drude, 'Theory of Optics'.

 Advanced Mathematical Electricity. Associate Professor Ram-Sey.

Fall, Winter and Spring terms, T. Th., at 8:00. Webster, 'Electricity and Magnetism'.

 Spectroscopy, with special attention to emission, reflection and absorption in the infra-red. Lectures and laboratory practice. ———.

Fall, Winter and Spring terms, T. Th., at 10:00.

16b. Laboratory Practice in Spectroscopy and Photometry, Professor Foley.

Fall, Winter and Spring terms, T. Th., at 2:00.

- Advanced Laboratory Methods and Research. Professor Foley.
 Fall, Winter and Spring terms, daily, at 1:00.
- Current Physical Literature. Professor Foley.
 Two hours per week at an hour to be appointed.
- 30. Advanced Theoretical Physics. Professor Foley.

 Two hours per week at a time to be appointed.

PUBLICATIONS BY MEMBERS OF THE DEPARTMENT

ARTHUR LEE FOLEY.

- 23. 'The Subject Matter of High School Physics', In The Teachers' Journal, IV, pp. 4-9. (July, 1904.) Also in Proc. Nat. Ed. Assn., 1904, pp. 865-870.
- 26. 'Interference Fringes about the Path of an Electric Discharge'. (Joint author with J. H. Haseman.) Proc. Ind. Acad. Sci. for 1904, p. 206.
- 27. 'Electromagnetic Induction in Conductors of Different Materials and in Electrolytes'. (Joint author with C. A. Evans.) Proc. Ind. Acad. Sci. for 1904, pp. 203-205.
- 29. 'Diffraction Fringes from Electric Discharges and from Fluid Streams'. Abstract. Phys. Rev., XX, pp. 399-400 (June, 1905).
- 30. 'Physical Science in 1905'. Indianapolis News, Dec. 30, 1905, 3 columns.
- 31. 'Note on the Molecular Forces in Gelatine'. Science XXIII, pp. 790-791. (May 18, 1906.)
- 32. 'A Simple Method of Determining the Absolute Dilatation of Mercury'. Sch. Sci. and Math., VI, pp. 598-601. (Oct., 1906.)

ROLLA ROY RAMSEY.

- 6. 'On the Use of Manganese Dioxide in the Generation of Oxygen from Potassium Chlorate'. (Joint author with A. L. Foley.) Proc. Ind. Acad. of Science, 1903.
- 7. 'An Investigation of N-Rays'. (Joint author with W. P. Haseman.) Proc. Ind. Acad. Sci., 1904, pp. 255-274, 15 plates.
 - 8. 'The Radium Clock'. Proc. Ind. Acad. Sci., 1905, p. 40.
- 'A Simple Method of Measuring Electrolytic Resistance'.
 Proc. Ind. Acad. Sci., 1905, pp. 115-116, 2 plates.
- 'Some Peculiarities of Electric Sparks Across Short Spark Gaps'. Proc. Ind. Acad. Sci., 1905, p. 117.
- 11. 'Gas Burners and Standards of Candle Power'. (Joint author with Hiromitsu Oi.) Proc. Ind. Acad. Sci., 1905, pp. 119-121, 2 plates.
- 12. 'Polarization of Standard Cells'. Phys. Rev., 21, pp. 56-58, 2 plates. (1905.)

REUBEN E. NYSWANDER.

- 3. 'The Absorption and Reflection of Calcite and Aragonite for Infra-Red Rays as Dependent upon the Plane of Polarization'. In Phys. Rev., XXVI, pp. 539-540. 1908.
- 4. 'The Absorption and Reflection of Calcite and Aragonite for Infra-Red Rays as Dependent upon the Plane of Polarization'. *In* Phys. Rev., XXVIII, pp. 291-308. 1909.
- 5. 'The Distribution of Energy in the Spectrum of the Tungsten Filament'. In Phys. Rev., XXVIII, pp. 438-445. 1909.
- 6. 'The Absorption and Reflection Spectra of Topaz as Dependent upon the Plane of Polarization'. *In* Phys. Rev., XXIX, in press.

DEPARTMENT OF GEOLOGY

EDGAR R. CUMINGS, Professor.

JOSHUA W. BEEDE, Associate Professor.

Candidates for graduation in this Department are required to complete forty-five hours of work in Geology, and in addition Zoölogy 1, Astronomy 1, and Chemistry 1. A certain portion of the work in Geology may represent investigation of some problem in the field. An opportunity is given the student to carry on such work during the summer vacation. The Department also offers courses leading to the Ph.D. degree.

The Department is provided with the following laboratories: (1) A geological laboratory and lecture room, used for general geology, and geography; (2) a mineralogical laboratory, which will accommodate twenty students; (3) an elementary paleontological laboratory, which will accommodate about six students; (4) two research laboratories; (5) a large museum room devoted to the study and installation of collections.

In the course in Mineralogy each student is provided with all the necessary apparatus for the determination of the common ores and rock-making minerals. The collections used in the course in elementary Mineralogy include about two hundred and twenty-five species. The crystallographic collections contain about two hundred and fifty wooden and plaster models, and a carefully selected collection of minerals illustrating characteristic crystal forms.

The facilities for geographical study have been much enlarged by the addition to the laboratory equipment of a large series of maps, charts, lantern slides, models, etc. The map collections furnish part of the necessary material for advanced geographical courses.

The Department is in possession of an extensive collection of fossils, including a type collection of invertebrates arranged in biological sequence, and a historical collection representing the characteristic life forms of the several geological epochs, as well as very large collections representing the Indiana formations. The latter include much unworked material, especially rich in the young stages of Brachiopoda and Bryozoa, which could serve as the basis of investigations in paleontological lines. The Department also possesses about 3,000 thin sections of fossils, mostly Bryozoa; and has all the facilities—rock slicer, grinding plates, etc.—for making sections.

The work of the Department for the Summer term consists in a detailed study of the field relations of some one of the geological formations of Indiana. For the present the Ordovician or Mississippian will be made the object of investigation. This work involves the determination of the areal, topographical and stratigraphical relations of the formation and its subdivisions, together with the collection of fossils and the accurate delimitation of faunal zones. Students electing this work must have

completed Course 1. Credit will be given for the work in proportion to the actual time spent in the field.

Work of this sort, but more advanced in character, may also be pursued by students who are candidates for an advanced degree. The State of Indiana affords many geological and geographical problems suited to form the basis of a thesis for the doctor's degree.

The Department receives the following periodicals: 'Geological Magazine', 'Quarterly Journal of the Geological Society of London', 'Zeitschrift der deutschen geologischen Gesellschaft', 'Neues Jahrbuch für Geologie Mineralogie und Paleontologie', 'Geologisches Centralblatt', 'Geographische Zeitschrift', 'Bulletin de la Societé Geologique de France', 'Annales de Geographie', 'Journal of the American Geographical Society', 'Annales de Paleontologie', 'Engineering and Mining Journal', 'School of Mines Quarterly', 'Journal of Geology', 'Economic Geology', 'Transactions of the St. Louis Academy of Science', 'Journal of the Cincinnati Society of Natural History', 'Bulletins of the Geological Society of America', 'Bulletin of the Geological Department of the University of California', 'Monthly Weather Review.'

COURSES FOR GRADUATES AND UNDERGRADUATES

 Economic Geology, Lectures, laboratory and field work on the geological relations, geographical distribution, and uses of the more common building stones, clays, cements, coals, oil and gas, and ores. Fully illustrated by lantern slides. The preparation of reports on assigned topics is required. Associate Professor Beede.

Winter term, daily, at 2:00.

This course may also be elected by Seniors in Geology or Chemistry.

 Systematic Paleontology. Training in the systematic study of fossils is given by means of careful determination in the laboratory of typical groups of Paleozoic invertebrates. Professor Cumings and Associate Professor Beede.

Fall, Winter, and Spring terms, two to five hours, at times to be arranged.

Open to students who have passed in Zoölogy 1, and Geology 1.

5a. Evolution. Study of the principles of organic evolution as illustrated by fossil organism. Professor Cumings.

Winter term, at an hour to be arranged.

Open to graduate students only.

 Research. Investigation of geological and paleontological problems. The results obtained, when of sufficient merit, will be published as 'Contributions from the Geological Laboratory of Indiana University'. Professor Cumings and Associate Professor Beede.

Fall, Winter, and Spring terms, daily, 9:00 to 4:50,

13. Advanced Field Work. This work is described in the general announcement above. It consists of continuous work in the field for a month or more during the Summer vacation. It will usually be taken up as part of a research problem by candidates for an advanced degree.

Open only to advanced students in Geology.

14. Stratigraphic Geology. A thorough study of the literature of the various geologic systems. The history of their investigation and the present knowledge of their divisions, distribution, faunas and paleogeography will be considered. Professor Cumings.

Fall, Winter and Spring terms. Lectures Tuesday and Thursday, at 10:00.

PUBLICATIONS BY MEMBERS OF THE DEPARTMENT

JOSHUA WILLIAM BEEDE.

24. 'Stratigraphy of the Eastern Outcrop of the Kansas Permian'. (Joint author with E. H. Sellards.) In American Geologist, pp. 83-111, 2 pl. (1905.)

25. 'Coal Measures Faunal Studies IV'. (Joint author with Austin F. Rogers.) In Kansas University Science Bulletin, Vol. III, pp. 377-388. (1906.)

- 26. 'Fauna of the Salem Limestone (in part); Protozoa to Pentremites; Echinoderma and Vermes; Brachiopoda and Pelecypoda'. 90 pp., 22 pl. In 30th Ann. Rep. Dept. Geol. and Nat. Res. of Indiana. (1906.)
- 27. 'Invertebrate Paleontology of the Upper Permian Red Beds of Oklahoma and the Panhandle of Texas'. *In* Kansas Univ. Sci. Bull., Vol. IV, pp. 115-171, 4 pl. (1907.)
- 28. 'Iron Ores of Martin County, Indiana'. (Joint author with C. W. Shannon.) In 31st Ann. Rep. Dept. Geol. and Nat. Res., Indiana, pp. 383-424, 5 pl. (1907.)
- 29. 'Faunal Divisions of the Kansas Coal Measures'. (Joint author with Austin F. Rogers.) *In* Rep. Univ. Geol. Surv. of Kansas, Vol. IX, pp. 318-385, 4 pl. (1909.)
- 30. 'Formations of the Marion Stage of the Kansas Permian'. (In press.)

EDGAR R. CUMINGS.

- 18. 'The Waverly Formations of Central Ohio'. (Joint author with C. S. Prosser.) In Amer. Geol., XXXIV, pp. 335-361, 3 pls. (Dec., 1904.)
- 19. 'Development of Fenestella'. In Am. Jour. Sci., XX, pp. 169-177, 3 pls. (Sept., 1905.)
- 20. 'On the Weathering of the Subcarboniferous Limestones of Southern Indiana'. *In Proc. Indiana Acad. Sci. for 1905*, pp. 85-100, 22 figures. (1906.)
- 21. 'Fauna of the Salem Limestone of Indiana'. (Joint author with J. W. Beede and others.) In 30th Ann. Rept. Dept. Geol. and Nat. Res. Indiana, pp. 1189-1486, 47 pls. (1906.)
- 22. 'The Stratigraphy and Paleontology of the Cincinnati Series of Indiana'. *In* 32d Ann. Rept. Dept. Geol. and Nat. Res. Indiana, pp. 607-1189, 55 pls., 16 text figures and 6 maps. (1908.)

F. C. GREENE.

- 'Fauna of the Florena shales of the Grand Summit section of Kansas and remarks on the Development of *Derbya multistriata* Meek and Hayden'. *In Proc. Indiana Acad. Sci. for 1907*, pp. 114-127, 3 pls.
- 2. "The Development of a Carboniferous Brachiopod, Chonctes granulifer, Owen'. In Jour. of Geology, XVI, pp. 654-663, 4 pls. (Oct.-Nov., 1908.)

- 'Ferns of Bloomington, Indiana'. In Fern Bulletin (Oct., 1998).
- 4. 'Notes on the Ferns of Southern Indiana'. In Fern Bulletin (in press).
- 'The Permian-Cretaceous contact in Northern Kansas'. In Kansas University Quarterly (in press). (1909.)
- 'Fauna of the Brazil limestone'. In 33d Ann. Rept. Dept. Geol. Nat. Res. Indiana (in press). (1909.)

C. W. SHANNON.

- 1. 'The roads and road materials of Monroe County, Indiana'. In 30th Ann. Rept. Dept. Geol. Nat. Res. Indiana, pp. 941-967; 10 pls., 1 map. (1905.)
- 'Drainage area of the East Fork of White River'. In Proc. Indiana Acad. Sci. for 1906, pp. 53-70; 10 pls., 1 map. (1907.)
- 3, 'The Iron Ore deposits of Indiana'. In 31st Ann. Rept. Dept. Geol. Nat. Res. Indiana, pp. 299-428; 19 pls., 17 text figures, 5 maps. (1907.)
- 4. 'The Indiana Soil Survey. Indiana Soil Types'. In 32d Rept. Dept. Geol. Nat. Res. Indiana, pp. 17-118; 12 text figures. (1908.)
- 5. 'Soil Survey of Monroe, Brown, Lawrence, Martin, Orange, Washington and Jackson Counties'. (Joint author with L. C. Snider.) In 32d Ann. Rept. Dept. Geol. Nat. Res. Indiana, pp. 119-196; 19 text figures, 7 maps. (1908.)
- 'Soil Survey of Perry, Dubois and Crawford Counties'. In
 Ann. Rept. Dept. Geol. Nat. Res. Indiana (in press). (1909.)

Essie A. Smith (Mrs. Alexander Shannon).

1. 'Development and Variation of *Pentremites conoideus*'. *In* 30th Ann. Rept. Dept. Geol. Nat. Res. Indiana, pp. 1219-1242; 5 pls., 3 text figures. (1906.)

L. C. SNIDER.

- 1. 'Soil Survey of Monroe, Brown, Lawrence, Martin, Orange. Washington and Jackson Counties'. (Joint author with C. W. Shannon.) In 32d Ann. Rept. Dept. Geol. Nat. Res. Indiana, pp. 119-196; 19 text figures, 7 maps. (1908.)
- 'Soil Survey of Daviess County'. In 33d Ann. Rept. Dept. Geol. Nat. Res. Indiana (in press). (1909.)

DEPARTMENT OF CHEMISTRY

ROBERT E. LYONS, Professor.
LOUIS S. DAVIS, Professor.
OLIVER W. BROWN, Associate Professor.
FRANK C. MATHERS, Assistant Professor.
CLARENCE E. MAY, Assistant Professor.

The Department of Chemistry has general, special, and private laboratories, a library room, a lecture room, balance rooms, an incubator room, a stock room, museum, etc. Special laboratories are provided for electrochemistry, assaying and electric furnace work, organic, inorganic and physiological chemistry, water and gas analysis, spectroscopic analysis. The laboratories comprise eleven large, well-lighted rooms, equipped with workstands, capable of accommodating two hundred and seventy-five students. Each room is provided with fume hoods and air registers connected with a ventilating fan for the removal of offensive and poisonous gases.

The general equipment for graduate work, including laboratory and library facilities, has been materially increased during the past year. A laboratory for electrometallurgy has been installed and fully equipped.

Special attention is given to inorganic, organic, physiological, physical and electro chemistry, technical analytical chemistry, and electro-metallurgy.

The graduate work of the Department, leading to the degrees A.M. and Ph.D., comprises advanced laboratory, lecture, library and seminary work in the lines indicated above, and special graduate courses described below. A thesis embodying original investigation is required for an advanced degree.

Graduate students should have a reading knowledge of German and French.

14. Seminary. Reports on current literature and special topics.
(1) Fall term: Inorganic Chemistry. Assistant Professor Mathers.
(2) Winter term: Organic Chemistry. Professor Lyons and Assistant Professor May.
(3) Spring term: Electro- and Industrial Chemistry. Associate Professor Brown and Assistant Professor May.

Fall, Winter, and Spring terms, Th., at 7:00 p.m.

- Research. Professor Lyons.
 Fall, Winter, and Spring terms, daily, 8:00 to 4:50.
 Open to fourth year and graduate students.
- 19. Physical Chemistry. Laboratory work in physico-chemical measurements supplementary to the lectures. Includes calibration of instruments, determination of molecular weights, thermo-chemical measurements, a study of the properties of solutions, the speed of chemical reactions, etc. Research work. Associate Professor Brown and Mr. Gamble.

Fall, Winter, and Spring terms, at hours to be arranged. Ostwald-Luther, 'I'hysiko-chemische Messungen'.

- 22. Electrochemistry. (A) Lectures on the general theory and laws of electrochemistry, and the principles and methods employed in the electrodeposition of metals for quantitative analysis, plating, separating, and refining. (B) Laboratory work in quantitative electrolytic analysis, electrochemical measurements and electroplating. Associate Professor Brown and Mr. Gamble.
 - Winter term. Lectures T. Th., at 8:00; laboratory work, M. W. F., 1:00 to 4:50.
 - Lehfelt, 'Electrochemistry'; Classen, 'Quantitative Electrolytic Analysis'; Pfanhauser, 'Elektroplattirung'.
 - Presupposes Chemistry 1 and 3, and Physics 1 and 2.
- 23. Electrochemistry. (A) Lectures. Electrolysis and electro-synthesis of inorganic and organic compounds, primary and secondary batteries, and a study of the various electrochemical and electro-metallurgical processes which are of commercial importance. (B) Laboratory work in the preparation of inorganic and organic compounds by electrolytic and electrothermal methods, and in testing primary and storage batteries. Associate Professor Brown and Mr. Gamble.

- Spring term. Lectures T. Th., at 8:00; laboratory work, M. W. F., 1:00 to 4:50.
- Elbs, 'Electrolytic Preparations'; Borchers, 'Electric Smelting and Refining'.
- 24. Advanced Electrochemistry and Electro-metallurgy. (A) Advanced laboratory work and research in pure and applied electrochemistry and electro-metallurgy, including investigations in electric furnace work, refining and extraction of metals, electro-synthesis of organic and inorganic compounds, manufacture of storage batteries, and of industrial electrochemical processes. (B) Lectures on the design and operation of commercial electric furnaces and on electric furnace processes and products. Associate Professor Brown and Mr. Gamble.
 - Fall, Winter, and Spring terms. Laboratory work, daily, 8:00 to 4:50; lectures, Winter term, F., at 8:00.
 - Students in this course are recommended to take Physics 10 and 24.
- 25. Advanced Organic Chemistry. A continuation of Course 6.
 (A) Lectures and recitations on selected chapters of organic chemistry. The topics considered in 1909 were: (a) The radical, (b) benzene nucleus, (c) stereoisomerism of carbon, (d) sugars, purins, proteins, terpenes and alkaloids.
 (B) Laboratory work or research in synthetic or analytical organic chemistry. Assistant Professor May.
 - (A) Winter and Spring terms, T. Th., 11:00. (B) Fall, Winter, and Spring terms, daily, 8:00 to 4:50.
 - Cohen, "Text Book of Organic Chemistry"; Roscoe and Schorlemer, "Treatise on Chemistry"; Hammersten, 'Physiological Chemistry"; Hensler-Pond, "Terpenes".

Presupposes Courses 6¹, 6², 7.

26. Chemical Engineering. Machinery, appliances and materials of construction in the chemical industries. Laws and principles involved in the operation of chemical processes on an industrial scale. Associate Professor Brown.

Fall term. Lectures, M. W. F., at 8:00.

Davis, 'Chemical Engineering'.

Open to Seniors and graduates.

- Storage Batteries. (.1) Lectures and recitations on the theory, operation, testing and design of storage batteries. (B) Laboratory work in the testing and building of storage batteries. Associate Professor Brown.
 - Fall term, lectures F., at S:00; laboratory work, one or more periods a week.
 - Dolezalek, 'Theory of the Lead Accumulator'; Lyndon, 'Storage Battery Engineering'.
 - For advanced work in the manufacture of storage batteries see Chemistry 24.
- 13. Elementary Metallurgy and Assaying. The course is given in alternate years. (A) Laboratory work. The fire assay of gold, silver, and lead ores. (B) Lectures on assaying and on elementary metallurgy, including a discussion of typical metallurgical processes. Associate Professor Brown and Mr. GAMBLE.
 - Fall term, lectures T. Th., at 8:00; laboratory work, F. S., 8:00 to 11:50.
 - Brown, 'Manual of Assaying'; Robert-Austen, 'Introduction to the Study of Metallurgy'.
 - Presupposes Geology 2 and Chemistry 5.
- 15. Quantitative Analysis. Advanced laboratory practice in technical and engineering analysis. The work is selected to meet the particular need of the student and as a preparation for actual work in commercial laboratories in the following lines:

 Iron ores, pig iron and steel; clay, limestone, rock and cement; soaps, fertilizers, soils, and foods; oils, varnishes and paints; testing of chemical reagents and water for industrial use; alloys, ores of copper, zinc, lead, tungsten, vanadium, manganese. The use of the microscope, spectroscope and refractometer in the examination of certain commercial products, foods, and beverages. Assistant Professor Mathers.
 - Spring term, daily, 8:00 to 4:50. Students will be received at any time during the term.
 - Fresenius, 'System of Quantitative Analysis'; Sutton, 'Volumetric Analysis'; Stillman, 'Engineering Chemistry'; Ulzer and Fraenkel, 'Techno-Chemical Analysis'; Classen, 'Quan-

- titative Analysis'; Olsen, 'Quantitative Analysis'; collateral reading.
- Presupposes Courses 1, 3, 4, and 5. This course is also open to special students,
- 31. Advanced Inorganic Chemistry. Laboratory work. The preparation and study of the properties and reactions of the different compounds of the rare and uncommon elements, followed by research. This includes a review of the literature relating to the element that is being studied. Assistant Professor Mathers,
 - Fall, Winter, and Spring terms, M. W. F., 8:00 to 4:50.
- 32. Gas and Fuel Analysis. (A) Lectures and recitations. Theory of gas and fuel analysis, and a description of the apparatus used. Calculation and interpretation of data dealing with problems in gas and fuel testing. (B) Laboratory work. Use and manipulation of the apparatus used in commercial gas analysis. Analysis of mixtures of gases, air, illuminating gas, and producer gas. Approximate and ultimate analysis of coal. Heating evaluation of coke, coal, oil, and peat, by the Parr calorimeter. Three-hour course. Assistant Professor MATHERS.
 - Winter term, lectures T., at 1:00; laboratory work at hours to be arranged.
 - Hempel-Dennis, 'Gas Analysis'; Gill, 'Gas and Fuel Analysis for Engineers'.
- 33. Spectrum Analysis and Sugar Analysis. (A) Lectures and Recitations. Theory and description of apparatus used in spectrum analysis. Outlines of the characteristic spectra of the different elements as used in qualitative analysis. Description of apparatus and the methods used in sugar analysis. (B) Laboratory work. Use of a Kruess spectroscope in mapping the emission, spark and absorption spectra of certain elements. Qualitative analysis with the spectroscope of unknown samples and of certain commercial products and minerals. Analysis of sugar by the polariscope and by chemical means according to the methods used in commercial sugar laboratories. Assistant Professor Mathers.

Fall term, lectures, F., 1:00; laboratory work at hours to be arranged.

Watts, 'Introduction to the Study of Spectrum Analysis'; Baly, 'Spectroscopy'; Rolfe, 'The Polariscope'.

PUBLICATIONS BY MEMBERS OF THE DEPARTMENT OLIVER W. BROWN.

- 5. 'Electric Smelting of Zinc'. (Joint author with Wm. F. Oesterle.) In Trans. Amer. Electrochem. Soc., 8, 171 (1905).
- 6. 'Reduction of Metal Sulphides'. In Trans. Amer. Electrochem. Soc., 9, 109 (1906).
- 7. 'Electrodeposition of Copper upon Iron'. (Joint author with F. C. Mathers.) In Jour. Phys. Chem., 10, 39 (1906).
- 8. 'Treatment of Storage Battery Elements Before Putting Them Out of Commission'. (Joint author with R. R. Sayers.) In Trans. Amer. Electrochem. Soc., 12, 311 (1907).

ROBERT EDWARD LYONS.

- 18. 'The Composition of Fourteen Indiana Clays'. In Annual Report of State Geologist, 1904.
- 'The Composition and Methods for the Analysis of Peat'.
 Annual Report of State Geologist, 1906, pp. 93-107.
- 20. 'The Composition of Forty Iron Ores from Indiana'. In Annual Report of State Geologist, 1906.
- 21. 'An Investigation of the Fuel Value of Indiana Peat and Indiana Coal'. In Proceedings Indiana Acad. Sci. for 1907.
- 'The Chemical Composition of Indiana Soils and Methods for Soil Analysis'. In Annual Report State Geologist, 1907.
- 23. 'Concerning a-Di-Naphtyl Selenide and Telluride'. (Joint author with G. C. Bush.) In Jour. Am. Chem. Soc., Vol. XXX, pp. 831-836, 1908; in Chemical Abstracts, Vol. 2, p. 2235.
- 24. 'A Chemical Examination and Calorimetric Test of Indiana Peats'. (Joint author with C. C. Carpenter.) In Jour. Am. Chem. Soc., Vol. XXX, pp. 1307-1311; in Chemical Abstracts, Vol. 2, p. 3277.
- 25. 'The Destruction of Platinum Crucibles Through the Ignition of Magnesium Ammonium Phosphate'. In Proc. Indiana Acad. Sci., 1908.
- 26. 'Notes on the Destruction of Platinum Crucibles in Phosphate Analysis'. In Jour. Industrial and Eng. Chem., Vol. I, 1909.

FRANK C. MATHERS.

- 'Electrodeposition of Copper Upon Iron'. (Joint author with O. W. Brown.) In Jour. Physical Chemistry, p. 39. 1906.
- 2. 'A Study of the Atomic Weight of Indium'. In Jour. Amer. Chem. Soc., pp. 486-496. 1907.
- 3. 'Eine Studie über das Atomgewicht des Indiums'. In Berichte der Deutschen Chemischen Gesellschaft, pp. 1220-1234. 1907.
- 4. 'The Formation of Selenic Acid from Lead Selenate'. In Proc. Indiana Acad. Sci., 1907.
- 'A Method for the Separation of Iron from Indium'. In Jour. Amer. Chem. Soc., pp. 209-211, 1908.
- 6. 'The Electrolytic Formation of Selenic Acid from Lead Selenate'. In Jour. Amer. Chem. Soc., pp. 1374-1378. 1908.
- 7. 'Some New Compounds of Indium'. In Jour. Amer. Chem. Soc., pp. 211-216. 1908.
- 8. 'An Evolution Method for the Determination of Sulphur in Sulphates'. In Proc. Ind. Acad. Sci., 1908.

CLARENCE EARL MAY.

- 1. 'Dissertation Concerning Some Nitrogen and Oxygen Ethers of the Type —C.OR:N—<- C:O.NR— in the Quinazoline Series'. p. 52. New York.
- 2. 'On the Quantitative Determination of Mucoid in Urine, Blood and Tissue Extracts'. (Joint author with W. J. Gies). Journal of Biological Chemistry, Vol. III, p. 42; Proceedings of the American Society of Biological Chemistry, 1907.
- 3. 'On Certain Quinazoline Oxygen Ethers'. (Joint author with M. T. Bogert.) In Jour. Am. Chem. Soc., Vol. XXI, pp. 507-513. (1909.) Assistant editor 'Chemical Abstracts', Vol. II, 1908.

G. A. Roush.

'The Electrolytic Preparation of Iodoform from Acetone'.
 Trans. Amer. Electrochem. Soc., 8, 281 (1905).

DEPARTMENT OF BOTANY

David M. Mottier, Professor. Frank M. Andrews, Associate Professor. James M. Van Hook, Assistant Professor.

Candidates for the degree of Bachelor of Arts in Botany are required to pursue a minimum of forty-five hours of work or its equivalent in the Department, together with one year's work in some other science. Students are urged to learn to read German books and papers on Botany.

Graduate work leading to the degree of Master of Arts in Botany comprises special studies along some line indicated in the advanced courses enumerated below, or the investigation of some problem of a more limited scope. For the degree of Doctor of Philosophy, the subject of the thesis is selected from some line of morphology, cytology, or physiology. A reading knowledge of German and French is assumed.

The Department occupies the second floor of Owen Hall, together with special laboratories in the basement, and a small greenhouse. On the second floor are the three well-lighted general laboratories, the office and private laboratory, the departmental library, and the general storeroom. A dark room for photographic and experimental work, constant temperature and incubator rooms, and a winter storage and work room are in the basement. The west laboratory on the second floor is used also for the Department lecture room. It is provided with a Zeiss projection apparatus by which it is possible to project upon the screen various phenomena of plant life, living organisms of miscroscopic size, miscroscopic preparations

of tissues and organs, as well as lantern slides and other transparencies.

The departmental library contains the more necessary works of reference and the principal botanical journals.

The research work in this Department during the past three or four years has been confined to studies in sporagenesis and spermatogenesis among higher plants.

Morphology of Fungi. A study of the life-history of representatives of the great groups of fungi, supplemented by a systematic acquaintance with various genera of the local flora.
 Lectures and laboratory work. Assistant Professor VAN HOOK.

Fall, Winter, and Spring terms, daily, 1:00 to 3:00.

5a. Physiology. Problems for investigation will be assigned to students who are prepared to do original work. Associate Professor Andrews.

Fall, Winter, and Spring terms, daily.

 Cytology. Practical application of modern methods in a study of nuclear and cell-division. Professor Mottier.
 Fall, Winter, and Spring terms, daily.

13. Morphology of the Algae. A study of the life-history and of the development of vegetative and reproductive organs in representative algae. The work is confined very largely to fresh-water forms. Lectures and laboratory work. Professor MOTTIER.

Fall term, daily, 1:30 to 5:00.

 Original Research. Problems for special investigation will be assigned to students who are prepared to undertake original work. Professor Mottier.

Fall, Winter, and Spring terms, daily.

Ability to read German and French is assumed.

18. Investigations in Mycology and Plant Pathology, Assistant Professor VAN Ноок.

Fall, Winter, and Spring terms, daily, 1:00 to 3:00.

PUBLICATIONS BY MEMBERS OF THE DEPARTMENT

FRANK MARION ANDREWS.

- 'Physiological Apparatus'. In Proceedings of the Indiana Academy of Science, 1904.
- 5. 'The Effect of Gases on Nuclear Division'. In Annals of Botany, Oct., 1905.
- 6. 'Die Anatomie von Epigaea repens'. In Beihefte zum Botanischen Centralblatt, Band XIX, Abt. I, Heft. 2, 1905.
- 'Plasmodesmen'. In Proceedings of the Indiana Academy of Science, 1905.
- S. 'The Effect of Alkaloids and Other Vegetable Poisons on Protoplasm'. *In* Proceedings of the Indiana Academy of Science, 1905.
- 9. 'Some Monstrosities in Trillium'. In Proceedings of the Indiana Academy of Science, 1905.
- 10. 'A Natural Proof that the Root Tip Alone is Sensitive to the Gravitation Stimulus'. *In* Proceedings of the Indiana Academy of Science, 1905.
- 11. 'Some Monstrosities in Trillium'. In The Plant World, May, 1906.
- 12. 'An Abnormal Porella Platyphylla'. In Botanical Gazette, Vol. XLV, 1908.

HARRY B. BROWN.

'Algal Periodicity in Certain Ponds and Streams'. In Bull. Torr. Bot. Club. 35, 223-248, 3 text figures, 1908.

J. M. VAN HOOK.

- 1. 'Diseases of Ginseng'. In Cornell Univ. Exp. Sta. Bull. 219, June, 1904.
- 2. 'Brown Rot, Its Effect on Fruit, Twigs, Leaves and Blossoms'. In Ohio State Hort. Rep., 1904.
- 3. 'Ascochyta Pisi, a Disease of Seed Peas'. In Ohio Naturalist, Apr., 1906.
 - 4. 'A Cause of Freak Peas'. In Torreya, Apr., 1906.
- 5. 'Blighting of Field and Garden Peas', In Ohio Agr. Exp. Sta. Bull. 173, Apr., 1906.
- 'A Disease of Ginseng Due to Phytophthora', In Special Crops, May, 1906.

- 7. 'Dying of Bearing Grape-Vines'. (Joint author with A. D. Selby.) In Ohio Agr. Exp. Sta. Circ. 64. Feb., 1907.
- 8. 'Celery Root Rot'. In Ohio Agr. Exp. Sta. Circ. 72. Aug., 1907.

CHARLES E. LEWIS.

'Studies on Some Anomalous Dicotyledonous Plants'. In Bot. Gaz., 37: 127-138, 2 pl., 1904.

ISAAC M. LEWIS.

'The Behavior of the Chromosomes in Pinus and Thuja'. In Ann. Bot., 22: 529-556, 4 pl., 1908.

D. M. MOTTIER.

- 24. 'The Embryology of Some Anomalous Dicotyledons'. In Ann. Bot., 19: 447-463, 4 pl., 1904.
- 25. 'The Development of the Heterotypic Chromosomes in Pollen Mother-Cells'. *In* Ann. Bot., 21: 309-347, 4 plates, 1907.
- 'The History and Control of Sex'. In Proc. Ind. Acad. Sci. for 1907.
- "The Present Status of the Chromosome Controversy". In Pros. Ind. Acad. Sci. for 1905.
- 28. 'The Blooming of Cereis Canadensis in September'. In Proc. Ind. Acad. Sci. for 1905.
- 29. 'A Peculiar Monstrosity in a Seedling of Zea Mays'. In Proc. Ind. Acad. Sci. for 1905.
- 'Some Anomalies in the Endosperm of Pinus. In Proc. Ind. Acad. Sci. for 1908.
- 31. 'The Development of the Heterotypic Chromosomes in the Megaspore Mother-Cell of *Lilium*. Ann. Bot., 23, 1909. (*In press.*)

WILLIAM L. WOODBURN.

- 'A Remarkable Case of Polyspermy in Ferns'. In Bot. Gaz., 44, 1907.
- 'Notes on the Native Seedless Persimmon' (preliminary report). In Proc. Ind. Acad. Sci. for 1908.

DEPARTMENT OF ZOÖLOGY

Carl H. Eigenmann, Professor and Director of the Biological Station.

CHARLES ZELENY, Associate Professor.

Full work leading to the degree Ph. D. is offered in Course 6. It is purely a research course and offers the widest choice of subjects commensurate with the equipment of the Department.

The subjects selected have radiated from two centers. One of these is the problem or problems of the fresh water fauna of tropical America. At the present the Department is engaged in a study of divergent evolution as shown by the tropical American Characin fishes and on a monograph on the fishes of British Guiana.

The Department is well equipped for this work. The most important of the zoölogical collections is the collection of fishes, comprising many thousand specimens. Arrangements have been made for cooperation with various other institutions by which the largest aggregation of collections of South American freshwater fishes in the world is available for a monograph in preparation. Collections have been received from Central America, through the Field Museum of Chicago; from Brazil, through the British Museum, and especially through the Museu Paulista of Sao Paulo, Brazil, and the National Museum at Rio de Janeiro. South American collections have been loaned by the Philadelphia Academy of Sciences, by the U.S. National Museum and Stanford University. By special arrangement the collections of Harvard University, made by L. Agassiz and his assistants during the Thaver expedition, and by others, are available for a monograph on the American Characius. The first section of this is in press.

The Department has entered into vital relations with

the Carnegie Museum of Pittsburg. Under the direction of Dr. W. J. Holland, director of this Museum, Mr. John Haseman, A.M., '07, of this University, has been exploring the coastal rivers of Brazil, Uruguay, and Argentina, between the Rio San Francisco and Buenos Aires. Mr. Haseman will devote the summer to the Paraguay basin.

During August to December, Prof. Eigenmann and Mr. S. E. Shideler, as volunteer assistant, explored the Demarara, Essequibo and Potaro Rivers of British Guiana. Very extensive collections were made in the lowland as well as above the Kaieteur, a vertical fall of 741 feet, of the Potaro River. The collections obtained are very rich in new species and duplicates of little known species. The results of the expedition are being published by the Carnegie Museum as reports of the British Guiana Expedition of Indiana University and the Carnegie Museum.

The second center of departmental interest has been and is the subject of heredity, especially: (A) The history of the sex cells, (B) Variation, (C) The rate of ontogenic and phylogenic modification of the sense organs of cave animals, (D) Regeneration.

For the study of (C) cave animals, the facilities of the Department are ideal. The University is located at the edge of the great cave region. By act of the Legislature the Donaldson estate near Mitchell, Indiana, has been placed in the keeping of the trustees of Indiana University. On it are situated numerous sink holes, dry caves and an underground water-course at least two miles long. This underground river is rich in blind fishes and other blind aquatic animals. A small laboratory dwelling has been erected on the farm and is in charge of a research assistant appointed from year to year. Applications for the assistantship should be sent to C. H. Eigenmann. Ap-

plicants must be able to be self-directive in large measure. In the study of cave animals the Department has in the past had the coöperation of the Carnegie Institution, the American Association for the Advancement of Science, and the Elizabeth Thompson Science Fund. A summarial volume on the work so far done has just been issued from the press of the Carnegie Institution, Washington, D. C.

For the study of (B) variation in non-migratory vertebrates in a "unit of environment" this Department organized and has since maintained a fresh-water Biological Station. It is at present located on Winona Lake, Kosciusko County, Indiana, in the grounds of the Winona Assembly. The Station owns, as a gift of the Winona Assembly, two buildings, 20 x 45 feet, each two stories high. The buildings are on the lake front, at the mouth of Cherry Creek. The Station also owns boats, nets, sounding and temperature apparatus, glassware, etc. Microscopes and other needed apparatus are moved to the Station from the University.*

For the study of (D) regeneration, under the sole direction of Dr. Zeleny, the Department owns all the necessary glassware, and a small stream flowing through the campus, and various small ponds about Bloomington offer an abundance of material.

3. Advanced Zoölogy. The work in this course is entirely individual. Each student selects, with the coöperation of the professor, some limited subject for special investigation. This course will serve for each student as an introduction to his special work in the Graduate School. Professor Eigenmann and Associate Professor Zeleny.

Fall, Winter, and Spring terms, one to fifteen hours a week. Selected monographs.

^{*}Further information concerning the Station will be found in the announcement of spring and summer courses, for which address the Registrar.

4a. General Biological Problems: The development of the idea of evolution and Darwinism. Lectures and reports. Professor EIGENMANN.

Winter term, M. W. F., at 8:00.

- 4b. General Biological Problems. The laws and theories of heredity. Lectures and reports. Professor Eigenmann.Spring term, T. Th., at 8:00.
- Seminary. Weekly meetings of advanced students and instructors to discuss current literature and report on investigations in progress. Professor Eigenmann and Associate Professor Zeleny.

Fall, Winter, and Spring terms, M., at 4:00.

6. Research. Special investigation of zoölogical problems, with a report on each investigation. Branches in which subjects have in the past been selected and reported upon are Variation, Degeneration, Regeneration, Sense Organs, Embryology of Fishes, Faunal and Systematic Studies of Fishes, Ecology of Cave and Freshwater Animals. For a fuller statement, see the general account of the Department. Professor Eigenmann and Associate Professor Zeleny.

Fall, Winter, and Spring terms, daily, 8:00 to 4:50.

 Biological Survey. A continuation of the previous year's work in the physical and biological features of Winona Lake and its environs. Professor Eigenmann.

Summer terms at the Biological Station.

The results obtained by students in Courses 3, 6 and 7, together with articles of the permanent staff of the Department, are published in various ways as contributions from the Zoölogical Laboratory of Indiana University. Of this series 106 numbers have been completed. A list of the titles from 1 to 58 was published in the Bulletin, vol. 1, No. 4 (November, 1903), and subsequent additions in catalogue numbers of the Bulletin, vols. I, III, IV, V, and VI.

PUBLICATIONS BY MEMBERS OF THE DEPARTMENT

A. M. BANTA.

- 1. 'The Fauna of Mayfield's Cave'. Carnegie Institution Publications, No. 67, pp. 1-114, pl. 1. Sept., 1907.
- 2. 'The Life History of Amblystoma opacum'. (Joint author with W. L. McAtee.) In Proceed. U. S. Nat. Museum, XXX, pp. 67-83, plates VIII-X, 1906.

MARION L. DURBIN (Mrs. MAX M. ELLIS).

- I. 'An Analysis of the Rate of Regeneration Throughout the Regeneration Process'. Journ. Exp. Zoöl. In press.
- 2. 'Reports of the Expedition to British Guiana of Indiana University and the Carnegie Museum of Pittsburg'. 2. 'New Species of *Hemigrammus* and *Hyphessobrycon'*. *In press. In* Ann. Carnegie Mus., VI, Pittsburg.

CARL H. EIGENMANN.

- 142. 'The Gymnotidæ'. (Joint author with David Perkins Ward.) In Proc. Wash. Acad. Sci., VII, pp. 159-188, plates VII-XI. June, 1905.
- 'The Fishes of Panama'. In Science, N. S. XXII, pp. 18-20. July 7, 1905.
- 144. 'Freshwater Fishes of South and Middle America'. In Pop. Sci. Mo., June, 1906, pp. 515-530.
- 145. 'The Smithsonian Institution and Research'. In Science. N. S. XXIV, pp. 553-556. Nov. 2, 1906.
- 146. 'An Account of Amazon River Fishes Collected by J. B. Steere, with a Note on *Pimelodus Clarias*'. (Joint author with Barton A. Bean.) In Proc. U. S. Nat. Mus. XXXI, pp. 659-668. Jan. 16, 1907.
- 147. 'On a Collection of Fishes from Buenos Aires'. In Proc. Wash. Acad. Sci. VIII, pp. 449-458, plates XXI-XXIII. Mch. 4, 1907.
- 148. 'The Pœciliid Fishes of Rio Grande do Sol and the La Plata Basin', In Proc. U. S. Nat. Mus. XXXII, pp. 425-433. May 23, 1907.
- 149. 'An Annotated List of Characin Fishes in the United States National Museum and the Museum of Indiana University, with Descriptions of New Species'. (Joint author with Fletcher Ogle.) Proc. U. S. Nat. Mus. XXXIII, pp. 1-36. Sept. 10, 1907.

- 'Fowler's Heterognathus Fishes, with a Note on the Stethaprioninæ'. In The American Naturalist, XLI, 767-772. Dec., 1907.
- 151. 'On Further Collections of Fishes from Paraguay'. (Joint author with David Perkins Ward.) *In* Ann. Carnegie Museum, IV, pp. 110-157, plates XXXI-XLV.
- 152. 'Preliminary Descriptions of New Genera and Species of Tetragonopterid Characins'. *In Bull. Mus. Corup. Zoöl.* 211, pp. 93-106. Dec., 1908.
- 153. 'Adaptation'. In Fifty Years of Darwinism. pp. 182-208, plates III and IV. May, 1909. Henry Holt & Co.
- 154. 'The Freshwater Fishes of Patagonia and an Examination of the Archiplata-Archhelenis Theory'. In Reports of the Princeton University Expeditions to Patagonia, 1896-1899, Vol. Zoöl. III, pp. 225. Quarto.
- 155. 'Blind Vertebrates of North America; a Study in Degenerative Evolution'. Publication of the Carnegie Institution No. 104. Quarto,
- 156. 'The Heterognathi of America; a Study in Divergent Evolution'. *In Memoirs* of the Museum of Comparative Zoölogy, Part I. Quarto. *In press*. Part H in preparation.
 - 157. 'The Fishes'. In Ward's Freshwater Biology. In press.

MAX M. ELLIS.

- 1. "The Influence of the Amount of Injury Upon the Rate of Regeneration in Mancasellus macronrus Garman'. In Biol. Bull. XIII, pp. 107-113. (Aug., 1907.)
- 'Notes on the Factors Controlling the Rate of Regeneration in Rana clamata Daudin'. In Biol. Bull., Vol. XIV, pp. 281-283, 1908.
- 3. 'The Relation Between the Amount Removed and the Amount Regenerated. In press.

WALTER LEWIS HAHN.

- 'Some Habits and Sensory Adaptations of Cave-Inhabiting Bats'. In Biol. Bull., Vol. XV, pp. 135-193, August and September, 1908.
- 'Notes on the Mammals and Cold-Blooded Vertebrates of the Indiana University Farm, Mitchell, Ind.' In Proc. U. S. Nat. Mus, XXXV, pp. 545-581, Dec. 7, 1908.
 - 3. 'The Mammals of Indiana'. In press.

JOHN DIEDRICH HASEMAN.

- 1. 'A New Campostoma from Indiana'. In Proceedings of the Indiana Academy of Sciences, pp. 161-163.
- 2. "The Direction of Differentiation in Regenerating Crustacean Appendages". In Archiv für Entwickelungsmech. d. Organismen, XXIV, pp. 617-637, plates XIX-XXVII. (Dec. 17, 1907.)
- 3. 'The Reversal of the Direction of Differentiation in the Chelipeds of the Hermit Crab'. In Archiv f. Entwickelungsmech. d. Organismen, XXIV, pp. 663-669, pl. XXI. (Dec. 17, 1907.)

LEONARD HASEMAN.

 'A Monograph of the North American Psychodidæ'. In Trans. Amer. Ent. Soc., 1907.

THOMAS J. HEADLEE.

- 1. 'Ecological notes on the mussels of Winona Lake', joint author with James Simonton. *In* Proceedings of the Indiana Academy of Sciences. 1903, pp. 173-180.
- 'Ecological Notes on the Mussels of Winona, Pike and Center Lakes of Kosciusko County, Indiana'. In Biol. Bull. XI, pp. 305-318. Nov., 1906.

GERTRUDE HITZE.

1. 'Bird nests of an old apple orchard near the Indiana University Campus'. In Proceedings of the Indiana Academy of Sciences for 1903. Pp. 167-173.

WALDO LEE MCATEE.

- I. 'The birds of the vicinity of Indiana University'. In Proceedings of the Indiana Academy of Sciences, 1904, pp. 65-202.
- 2. 'A List of the Mammals, Reptiles and Batrachians of Monroe County'. In Proceedings of the Indiana Academy of Sciences. Proc. Biol. Soc., Wash., XX, pp. 1-16.
 - 3. See Banta and McAtee.

NORMAN E. McIndoo.

1. 'On some fishes of western Cuba'. In Proc. Phil. Acad. Nat. Sc., 1907.

NEWTON MILLER:

1. 'The fishes of the Motagua River, Guatemala'. In Bull. Amer. Mus. Nat. Hist., XXIII, pp. 95-123.

MRS. EFFA FUNK MUHSE.

 'The cutaneous glands of the toad'. In Journal of Anatomy, 1909.

FLETCHER OGLE.

See Eigenmann, No. 149.

FERNANDUS PAYNE.

- 1. 'The eyes of the blind vertebrates of North America, VII. The eyes of Amphisbæna punctata (Bell). A Blind Lizard from Cuba'. In Biol. Bull., XI, pp. 60-67, plates I and II, July, 1906.
- 2. 'The reactions of the blind fish Amblyopsis spelaeus to light'. In Biol. Bull., Vol. XIII, pp. 317-323. Nov., 1907.

Frank H. Pike.

 'The degenerate eyes in the Cuban cave shrimp. Palæmonetes Eigenmanni Hay'. In Biol. Bull., Vol. XI, pp. 267-276. Oct., 1906.

WILL SCOTT.

1. 'An ecological study of the plankton of Shawnee cave'. In press.

JAMES SIMONTON.

See Headlee and Simonton. -

EDNA RUSSELL THAYER.

'A Day's Work in Bird-land'. In The Nature Study Review, II, pp. 289-295.

DAVID PERKINS WARD.

See Eigenmann, Nos. 142 and 157.

CHARLES ZELENY.

- 1. 'The early development of the hypophysis in Chelonia'. *In* Biological Bulletin, Vol. II, No. 6, pp. 267-281. 1901. 9 figs.
- 'A case of compensatory regulation in the regeneration of Hydroides dianthus'. In Archiv für Entwickelungsmechanik der Or-ganismen, XIII, pp. 597-609. 1902. 3 figs.
- "The dimensional relations of the members of compound leaves". In Bull. N. Y. Botanical Garden, Vol. 3, No. 9, pp. 134-174, 13 figs.

- 4. 'A study of the rate of regeneration of the arms in the brittlestar. Ophioglypha lacertosa'. In Biol. Bull., Vol. VI, Dec., 1903, pp. 12-17. 1 fig.
- 'Experiments on the localization of developmental factors in the Nemertine egg'. 19 figs. In Journ. Exp. Zool., Vol. I, pp. 293-329, 1904.
- 'Compensatory Regulation'. In Journ. Exp. Zool., Vol. 11, pp. 1-102. May, 1905. 29 figs.
- The rearing of Serpulid larvae, with notes on the behavior of the young animals'. In Biol. Bull., Vol. VIII. April, 1905. Pp. 308-312. 3 figs.
- 'The direction of differentiation in a regenerating appendage'.
 Science, Vol. XXI. 1905.
- 9. 'The regeneration of an antenna-like organ in place of the vestigial eye of the blind crayfish'. In Science, N. S. XXI. 1905.
- "The relation of the degree of injury to the rate of regeneration". In Science, N. S. XXI. 1905.
- 11. 'The regeneration of a double chela in the fiddler crab (Gelasimus pugilator), in place of a normal single one'. 1 fig. In Biol. Bull. IX. Aug., 1905. pp. 152-155.
- 12. 'The relation of the degree of injury to the rate of regeneration'. 6 figs. In Journ. Exp. Zool., Vol. II, 347-369.
- 13. 'The direction of differentiation in development. I. The antennule of Mancasellus macrourus'. In Archiv. f. Entwickelungsmechanik, XXIII. March, 1907. pp. 324-343. 7 plates.
- 14. 'The effect of degree of injury, successive injury and functional activity upon regeneration in the Scyphomedusan, Cassiopea xamachana'. *In* Journ. Exp. Zool., Vol. V. Dec., 1907. Pp. 267-274, figs. 4.
- 15. 'Some internal factors concerned with the regeneration of the chelae of the Gulf-weed crab, Portunus Sayi'. *In Carnegie Institution of Washington*, Tortugas Volume II, pp. 105-138. 2 text figures and 11 'table' figures. 1909.

PHYSIOLOGY AND PHARMACOLOGY

WILLIAM J. MOENKHAUS, Professor, DENNIS E. JACKSON, Assistant Professor.

Facilities for research leading to the higher degrees are available within restricted lines in general Physiology.

COURSES FOR UNDERGRADUATES AND GRADUATES

 Advanced Physiology. A comprehensive experimental study of some selected phase of mammalian physiology or of general physiology. Laboratory work and assigned reading. Professor Moenkhaus.

Fall, Winter, and Spring terms, at hours to be arranged.

 Pharmacology. An experimental course in the physiological action of the more important drugs upon mammals and amphibia. Assistant Professor Jackson.

Spring term, M. W. F., 1:00 to 4:50.

Open to students who have passed in Courses 4 and 5.

COURSE FOR GRADUATES

 Research. Problem work in certain phases of general physiology may be taken by those properly equipped. Professor MOENKHAUS, and Assistant Professor Jackson.

Fall, Winter, and Spring terms, daily, 8:00 to 4:50.

PUBLICATIONS BY MEMBERS OF THE DEPARTMENT

DENNIS EMMERSON JACKSON.

 The Prolonged Existence of Adrenalin in the Blood. In Am. Journ. of Physiol., Vol. XXIII, No. IV, p. 226-245. 1909.

WILLIAM J. MOENKHAUS.

 "The Control of Sex'. In Central States Monitor, Vol. X. No. 6, p. 215-218, 1907.

16. 'Selective Fertilization among Fishes'. In press.

DEPARTMENT OF ANATOMY

Burton D. Myers, Professor.
Augustus G. Pohlman, Professor.

Graduate work of this Department is given under Courses 13 and 15. These courses consist of special problems in gross and microscopic anatomy.

13. Research Work. Opportunity for research work will be offered to advanced students who may have at least one-half their time for one year free for the work. Professors Myers and Pohlman.

Fall, Winter, and Spring terms, at hours to be appointed.

15. Advanced Conrse in Anatomy. Open to students who have completed the dissection of the human body and desire to do special or advanced work. Professors Myers and Pohleman. Fall, Winter, and Spring terms, at hours to be appointed.

PUBLICATIONS BY MEMBERS OF THE DEPARTMENT

BURTON D. MYERS.

- 1. 'Anatomical Basis for Reflex Movements'. In Journal of the Indiana State Medical Association, for January, 1908.
- 2. 'Review of Rauber's Lehrbuch der Anatomie des Menschen'. In Anatomical Record, Nov., 1908.
- 3. 'Psychotherapy'. In Journal of Indiana State Medical Association, for April and May, 1909.

Augustus G. Pohlman.

- 1. 'Concerning the Embryology of Kidney Anomalies'. In American Medicine, Vol. VII, '04, 987-990.
- 2. 'Developmental Relations of the Kidney and Ureter in Human Embryos'. In Johns Hopkins Bull., Vol. XVI, '04, 49-51.
- 3. 'Abnormalities in Form of Kidney and Ureter dependent of the Development of the Renal Bud'. *Ibid.* '04.51-69.
- 4. 'A Case of Fused Kidneys', In Indiana Med. Jr., Vol. XXIII, '04, 217-219.

- 5. 'Has a Persistence of the Müllerian Ducts any relation to the Condition of Cryptorchidism?' In American Medicine, Vol. VIII, '04 (1003-1006).
- 6. 'The Etiology of Eyestrain from a Phylogenetic and Ontogenetic Standpoint'. *In Jr. Amer. Med. Assc.*, May 6th, '05.
- 7. 'Ein neues Projektionszeichenbrett'. In Ztsch. f. wiss. Mikr., Vol. XXIII, 41-44, '06.
- 8. 'Some of the Disadvantages of the Upright Position'. In American Medicine, Vol. I (new series), 541-546, '06.
- 9. 'The Elements of Three Dimension Reconstruction'. Manuscript incorporated in Karl Peter's Methoden der Rekonstruction. G. Fischer, '06.
- 10. 'The Purple Island by Phineas Fletcher'. In Johns Hopkins Bull., Vol. XVI, 317-321, '07.
- 11. 'The Fetal Circulation through the Heart'. (Preliminary.) In Johns Hopkins Bull., Vol. XVIII, 409-412, '07.
- 12. 'Multiple Anomalies in the Upper Extremities of One Cadaver'. *In Jr.* of Anat. and Phys., Vol. 42, Pt. IV, '08.
- 13. Review of 'Treves' Surgical Applied Anatomy.' In Anat. Record, Vol. 2, No. 3, '08.
- 14. 'The Course of the Blood through the Heart of the Fetal Mammal'. In Anat. Record, Vol. III, No. 2, 75-109.
- 'The Circulation of Mixed Blood in the Amphibian and Reptile, as well as in the Embryo Bird and Mammal'. In Proc. Indiana Acad. In press.
- 16. 'The Development of the Cloaca in Human Embryos'. In Jr. of Anatomy. In preparation.
- 17. Review of 'Schultze's Topographische Anatomie', and Corning's 'Lehrbuch der topographischen Anatomie'. In Anat. Record. In preparation.

DEPARTMENT OF PATHOLOGY

HENRY R. ALBURGER, Professor.

The Department of Pathology is located in four large, well-lighted rooms on the third floor of Wylie Hall. These consist of a very large main laboratory, a lecture room and museum, an incubator and sterilizing room, and a private office for the head of the Department.

The main laboratory is capable of seating fifty or more workers at laboratory desks, is lighted from the north by large windows running to the ceiling and by three skylights, and contains a full equipment for workers in Bacteriology and Pathology. Within this room there are built in two smaller rooms for special work in Bacteriology and Pathology and Pathological technique. Opening into the main room by an arched doorway is the sterilizing room, containing incubators, steam and hot air sterilizers, blood serum inspissator, water still, and water and electric centrifuges. The room also contains cages for animals for immediate use.

Next to the main laboratory is a smaller room, capable of seating fifty students at lecture. It is also used as a museum. Here a collection of gross pathological specimens is rapidly being accumulated and mounted in a manner convenient for study and reference.

The office of the head of the Department is near at hand and is furnished with a very complete working reference library containing the majority of the periodicals on the subjects covered by the Department, in English, German and French.

In connection with the Department there is an animal barn in which are kept a number of the small laboratory animals for use in research. The apparatus and equipment is ample for any ordinary line of research in Pathology, and is of the best quality. No expense has been spared by the University to make the equipment of this Department complete.

The undergraduate work consists of three terms' work of six hours each, covering the subjects of Bacteriology, General Pathology, and Special Pathology. (See Catalogue.)

4. Advanced work and research. Those who have had sufficient training or who show especial ability may obtain an opportunity to enter upon advanced diagnostic work or research work under the direction of the head of the Department. This opportunity can only be offered to a limited number, but facilities can be offered for work along any of the lines of Pathological or Bacteriological research. Professor Alburger.

Fall, Winter, and Spring terms, daily, 8:00 to 4:50.

EDUCATION

WILLIAM LOWE BRYAN, President of the University, Acting Dean. *Ernest O. Holland, Professor of Secondary Education.

WILLIAM W. BLACK, Professor of the Science and Art of Teaching. Elmer E. Jones, Professor of the History and Philosophy of Education.

George F. Arps, Associate Professor of Educational Psychology.

Graduation from the School of Education, with the University degree of A.B. and a Bachelor's Certificate of Education, requires one hundred eighty credit hours, at least forty-five of which must be in pedagogical subjects.

Special programs of work for the M.A. and Ph.D. degrees, with the Master's and Doctor's Certificates of Education, will be recommended on application. In general

^{*}Absent on leave.

the work of one student will differ somewhat from that of another, according to the practical career the student has in view.

A special bulletin, obtainable from the Registrar, contains brief indications of the collateral courses in Biology, Psychology, Sociology, Philosophy, and History most likely to be of service to the graduate student in Education.

In the future, as in the past, the best work of students in the courses in research work and the pedagogical seminary will be published under the head of 'Contributions from the Pedagogical Seminary of Indiana University,'

The following are the graduate courses in Education:

- G. History of Education. (1) Fall term: Education in primitive society. Oriental education, using China and Persia as types. Greek education and the development of individualism; thorough study of the Greek educational theorists. Roman education and the practical ideals evolved. Her educational theorists. (2) Winter term: General survey of education during the whole of the Middle Ages. The Renaissance and humanistic conceptions of education. The permanent type of the humanistic schools. (3) Spring term: The Reformation and the religious conceptions of this period. Luther, Melanchthon, and other reformers. Rousseau and education according to nature. Pestalozzi, Froebel, and Herbart. Professor Jones.
 - Fall, Winter, and Spring terms, T. Th., at 8:00.
 - Open to students who have passed in Education 1 and 2, and History 1, 2, and 3.
- 10. Philosophy of Education. (1) Fall term: A synthetic study of the constructive principles in the thought of educational thinkers from Descartes to the present time. Special emphasis upon the conceptions of Bacon, Comenius, Rousseau, Pestalozzi, and Herbart. (2) Winter term: The formal side of the educative process will be given from the standpoint of the individual. Questions of inhibition, facilitation,

period of infancy, play, current theories of discipline, interest, and correlation will be considered. (3) Spring term: Education will be considered chiefly in view of the demands which society makes upon the individual. The effort will be to harmonize the development of the child as an individual with the factors of the environment. Education will be shown to be a unifying of the individual and social forces to bring about harmony and efficiency. Professor Jones.

Fall, Winter, and Spring terms, M. W. F., at 8:00.

Open only to Seniors and Graduate students who have passed in Courses 1 and 2.

11. Principles of Organization and Supervision. Development of the law and principles that control in the organization and conduct of the school. The law evolving the school. The curriculum under its logical and psychological aspects; the basis for making a course of study; comparison of typical courses. Universal method in teaching. The organization of a subject. The organic relation of the logical, esthetic, and ethical ends in education. Professor Black.

Fall, Winter, and Spring terms, T. Th., at 2:00.

Open to Graduate students, and to teachers of wide experience.

16. Educational Seminary. Members meet once a week for the discussion of some educational question decided upon at the beginning of the term. There will be reports upon assigned topics, lectures and discussions. Credit of from two to five hours. Professor Jones.

Fall, Winter, and Spring terms, Th., at 2:00.

Open only to Seniors and Graduate students.

5. Research. Students who are majoring in Education for the A.M. or the Ph.D. degree should register in this course. A special problem of research will be assigned and must be worked out as a requisite for the higher degree. The research for the A.M. degree should extend over a period of at least one year after the A.B. degree has been granted; for the Ph.D. degree the time will vary from two to four years, depending upon the ability of the student and the character of the research. Amount of credit to be arranged with the professor in charge.

- a. The problems of the Elementary School. Professor Black.
- b. The History and Philosophy of Education. Professor Jones.
- c. The Psychology of the Processes of Education. Associate Professor Arps.
- d. Secondary Education. ——.
 - Fall, Winter, Spring, and Summer terms, at hours to be arranged.

PUBLICATIONS BY MEMBERS OF THE DEPARTMENT

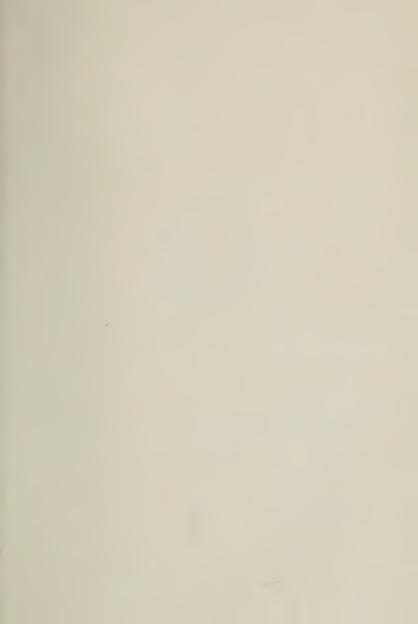
GEORGE FREDERICK ARPS.

- 'Der Verlauf der Aufmerksamkeit bei rhythmischen Reizen'.
 (Joint author with O. Klemm.) In Wundt's Psychologische Studien', Band, IV. Heft. 6.
- 2. Über den Austieg der Druckempfindungen'. In Wundt's 'Psychologische Studien'. Band IV, Heft. 4, 5.

ELMER ELLSWORTH JONES.

- 1. 'The Emotions and the Change from the Quadrupedal to the Erect Posture'. *In* University of Colorado Studies, 1901,
- 2. 'Suggestion: a Study in Education', In University of Colorado Studies, 1902.
- 3. 'The Psychic Value of Labor in the Evolution of Society'. In University of Colorado Studies, 1902.
- 4. 'The Early Reactions of Children to Sense Impressions'. In Proceedings of the Southern Educational Association, 1904, pp. 226-234.
- 5. "The Function of the Normal School". In Virginia School Journal, 1907.
- 6. 'The Influences of Bodily Posture on Mental Activities'. In Columbia Contributions to Philosophy and Psychology, Vol. XVI, No. 2. October, 1907.
- 'The Waning of Consciousness under Chloroform', In Psychological Review, January, 1909.
- S. 'A Concrete Example of the Value of Individual Teaching'. In Psychological Clinic, December, 1908.
- 9. Review of Stevenson Smith's 'The Limits of Educability in Paramoecium'. Journal of Philosophy, Psychology, and Scientific Methods, Vol. VI, No. 8, April 15, 1909.
- 10. Review of Cliff Winfield Stone's 'Arithmetical Abilities and some Factors determining them'. Educational Review. *In press*,







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VOL. VIII. No. 4.

May 15, 1910

INDIANA UNIVERSITY BULLETIN



GRADUATE SCHOOL 1910

Entered as second-class matter May 16, 1908, at the postoffice at Bloomington, Indiana, under act of Congress of July 16, 1894

University Calendar

SUMMER TERM, 1910

June 23, Thursday. Registration and enrollment for the

Summer term.

June 24, Friday. Recitations and lectures begin for the

First half-term. (Instruction five

days a week.)

Aug. 2, Tuesday. First half-term ends.

Aug. 3, Wednesday. Recitations and lectures begin for

Second half-term. (Instruction six days a week.)

Sept. 2, Friday. Summer term ends.

FALL TERM, 1910-11

Sept. 22, Thursday. Registration and enrollment in classes for the Fall term.

Sept. 23, Friday. Recitations and lectures begin.

Nov. 24 and 25, Thursday

and Friday. Thanksgiving recess.

Dec. 16, Friday. Fall term ends.

WINTER TERM, 1910-11

Jan. 3, Tuesday. Registration and enrollment in classes for the Winter term.

Jan. 4, Wednesday. Recitations and lectures begin.
Jan. 20, Friday. Foundation day, a holiday.

Feb. 22, Wednesday, Washington's birthday, a holiday.

Mar. 24, Friday. Winter term ends.

SPRING TERM, 1910-11

Mar. 30, Thursday. Registration and enrollment in classes for the Spring term.

Mar. 31, Friday. Recitations and lectures begin.

June 20, Tuesday. Spring term ends.

June 21, Wednesday. University Commencement.

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INDIANA UNIVERSITY

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Physiology																				
Pathology																	 			

INDIANA UNIVERSITY BULLETIN

VOL. VIII

BLOOMINGTON, IND., MAY 15, 1910

NO. 4

Entered as second-class matter May 16, 1908, at the postoffice at Bloomington, Indiana, under the Act of July 16, 1894. Published from the University office, Bloomington, Indiana, semi-monthly April, May, and June, and monthly January, February, March, July, September, and November.

Prefatory Note

The Indiana University, situated at Bloomington, Indiana, is the State University of Indiana and the head of the public school system of the State. It takes its origin from the State Seminary, which was established by act of the Legislature, approved January 20, 1820. In 1828 the title of the Seminary was changed by the Legislature to that of the Indiana College; and in 1838 the University was given its present name and style. In 1867 Indiana University became coeducational.

The University consists at present of—

The College of Liberal Arts, organized in 1828,

The School of Law, organized in 1842, re-organized in 1889,

The School of Medicine, organized in 1903,

The Graduate School, organized in 1904,

The School of Education, organized in 1908.

The first advanced degrees, conferred for graduate work, were granted in 1882. During the eighties, well de-

fined regulations for graduate work and graduate degrees were stated in the University catalogue, and a considerable number of graduate students were enrolled, especially in the natural sciences. In the years 1882 to 1893, inclusive, the University graduated 14 Doctors of Philosophy, 99 Masters of Arts, and 12 Masters of Science. For some years following 1893, however, the degree Doctor of Philosophy was not conferred.

In 1904 there took place a segregation and formal organization of the Graduate School, and in 1908 the office of Dean of the Graduate School was created.

This number of the Bulletin is devoted to setting forth the facilities for graduate work in the several Departments of the University. Courses intended primarily for graduate students in the subject under consideration are described in full. Only skeleton announcements are given of courses intended for both graduates and undergraduates. For further description of the latter courses, see the bulletin of the College of Liberal Arts, or under that heading in the University catalogue.

The attention of graduates of other Indiana colleges is invited to the announcement on a subsequent page of ten fellowships, recently established by the Board of Trustees, for such students. The value of these fellowships is \$200 each; they also carry with them exemption from Contingent and Library fees. For further information concerning the Graduate School, address,

THE DEAN OF THE GRADUATE SCHOOL, Bloomington, Indiana.

Officers and Faculty of the Graduate School

COUNCIL

Carl H Eigenmann, Ph.D., Professor of Zoölogy, Dean of the Graduate School.

Harold Whetstone Johnston, Ph.D., L.H.D., Professor of Latin. Arthur Lee Foley, Ph.D., Professor of Physics.

ULYSSES GRANT WEATHERLY, Ph.D., Professor of Economics and Social Science.

ERNEST HIRAM LINDLEY, Ph.D., Professor of Philosophy and Psychology.

*Samuel Bannister Harding, Ph.D., Professor of European History. Bert John Vos, Ph.D., Professor of German.

ROBERT EDWARD LYONS, Ph.D., Professor of Chemistry.

ALBERT FREDERICK KUERSTEINER, Ph.D., Professor of Romance Languages.

*WILL DAVID HOWE, Ph.D., Professor of English.

ELMER ELLSWORTH JONES, Ph.D., Professor of History and Philosophy of Education.

FACULTY

WILLIAM LOWE BRYAN, Ph.D., LL.D., President of the University.

Horace Addison Hoffman, A.M., Professor of Greek.

James Albert Woodburn, Ph.D., LL.D., Professor of American History and Politics.

Carl H Eigenmann, Ph.D., Professor of Zoölogy, and Director of the Biological Station.

HAROLD WHETSTONE JOHNSTON, Ph.D., L.H.D., Professor of Latin.

ROBERT EDWARD LYONS, Ph.D., Professor of Chemistry.

ARTHUR LEE FOLEY, Ph.D., Professor of Physics.

DAVID MYERS MOTTIER, Ph.D., Professor of Botany.

^{*}Absent on leave, from August 1, 1910.

ALBERT FREDERICK KUERSTEINER, Ph.D., Professor of Romance Languages.

ULYSSES GRANT WEATHERLY, Ph.D., Professor of Economics and Social Science.

Ernest Hiram Lindley, Ph.D., Professor of Philosophy and Psychology.

*Burton Dorr Myers, A.M., M.D., Professor of Anatomy.

†Samuel Bannister Harding, Ph.D., Professor of European History.

Amos Shartle Hershey, Ph.D., Professor of Political Science and International Law.

Bert John Vos, Ph.D., Professor of German.

WILLIAM A RAWLES, Ph.D., Professor of Political Economy.

CARL WILHELM FERDINAND OSTHAUS, A.M., Professor of German.

Schuyler Colfax Davisson, Sc.D., Professor of Mathematics.

David Andrew Rothrock, Ph.D., Professor of Mathematics.

William J Moenkhaus, Ph.D., Professor of Physiology.

Louis Sherman Davis, Ph.D., Professor of Chemistry.

LOUIS SHERMAN DAVIS, TH.D., Professor of Chemistry

WARNER FITE, Ph.D., Professor of Philosophy.

†WILL DAVID HOWE, Ph.D., Professor of English.

Ernest Otto Holland, A.B., Professor of Secondary Education.

Augustus Grote Pohlman, M.D., Professor of Anatomy.

HENRY RIHL ALBURGER, M.D., Professor of Pathology.

WILLIAM WESLEY BLACK, A.M., Professor of Elementary Education.

ELMER ELLSWORTH JONES, Ph.D., Professor of the History and Philosophy of Education.

CHARLES JACOB SEMBOWER, Ph.D., Professor of English.

EDGAR ROSCOE CUMINGS, Ph.D., Professor of Geology.

ROYAL BRONSON WAY, Ph.D., Acting Professor of History.

George Davis Morris, A.M., Associate Professor of French.

FRANK WILLIAM TILDEN, A.M., Associate Professor of Greek.

Guido Hermann Stempel, A.M., Associate Professor of Comparative Philology.

CHARLES ALFRED MOSEMILLER, A.B., Associate Professor of Romance Languages.

Rolla Roy Ramsey, Ph.D., Associate Professor of Physics.

OLIVER W Brown, A.M., Associate Professor of Chemistry.

Frank Marion Andrews, Ph.D., Associate Professor of Botany

^{*}Absent on leave, Spring term, 1910.

[†]Absent on leave, from August 1, 1910.

LILLIAN GAY BERRY, A.M., Associate Professor of Latin.

HENRY THEW STEPHENSON, B.S., A.B., Associate Professor of English.

Frank Aydelotte, A.M., B.Litt., Associate Professor of English.

WILBUR ADELMAN COGSHALL, A.M., Associate Professor of Astronomy.

George Frederick Arps, Ph.D., Associate Professor of Educational Psychology.

ULYSSES SHERMAN HANNA, Ph.D., Associate Professor of Mathematics.

Joshua William Beede, Ph.D., Associate Professor of Geology.

*Edward Payson Morton, A.M., Assistant Professor of English.

EUGENE LESER, Ph.D., Assistant Professor of German.

James M Van Hook, A.M., Assistant Professor of Botany.

FRANK CURRY MATHERS, Ph.D., Assistant Professor of Chemistry.

CLARENCE EARL MAY, Ph.D., Assistant Professor of Chemistry.

DENNIS EMERSON JACKSON, Ph.D., Assistant Professor of Physiology.

MELVIN EVERETT HAGGERTY, Ph.D., Assistant Professor of Philosophy, and Director of the Psychological Laboratory.

Fernandus Payne, Ph.D., Assistant Professor of Zoölogy.

RICHARD ASHLEY RICE, A.M., Acting Assistant Professor of English.

VERNON ANDREW SUYDAM, B.S., Instructor in Mechanics.

Kenneth Powers Williams, A.M., Instructor in Mathematics.

CLARENCE JAMES FOREMAN, A.M., Instructor in Economics and Social Science.

DAVID ABBOTT DREW, A.M., Acting Instructor in Mechanics (1909-10).

^{*}Absent on leave.

General Statement of the Graduate School

Purpose and Administration. The Graduate School furnishes opportunities for advanced work leading to careers in higher education and in certain lines of investigation. It does not offer work leading to professional degrees in Law or in Medicine.

The work of the School is a direct continuation of that of the College of Liberal Arts, and as such is the most advanced work in education undertaken by the State. The Graduate School stands, therefore, at the head of the University, and is the culmination of the public school system of the State.

The school is administered by the Council of the Graduate School. It is composed of members of the Faculty representing different fields of learning.

Not all Departments of the University are at present equally equipped for extended graduate work. In recognition of this fact, the amount and nature of the graduate work offered by the different Departments varies. Some Departments offer work for the A.M. degree only, while others offer work leading to the degree of Ph.D.

Admission. Students holding a bachelor's degree in Arts or Science from Indiana University, or the same degree or its equivalent from institutions of equal rank, are admitted to the Graduate School on presentation of the proper credentials. Persons holding the bachelor's degree from institutions whose requirements are considered to lack a year or more of being the equivalent of the A.B. from this institution, are not admitted to the Graduate

School. They may enter the College of Liberal Arts and are referred to the Dean of the College for their standing. Holders of the A.B. or its equivalent from institutions whose requirements lack less than a year of being the equivalent of the A.B. from this institution, may be admitted to the Graduate School. In such cases, work in addition to the minimum of forty-five hours for the degree, will be demanded. The amount will be determined in each case by the Council of the Graduate School.

All graduate students will enroll at the beginning of each term, and those entering regularly organized classes will submit to the same regulations as undergraduate students. Work will in many cases be individual and not controlled by a recitation schedule. At the time of entrance to the Graduate School the student must submit a plan of the entire work he wishes to present for the master's or doctor's degree. This plan must be approved by the professor of the major subject and the Dean of the Graduate School.

Fees. Students who are legal residents of the State of Indiana are charged a Contingent fee of five dollars a term, and a Library fee of one dollar a term, except in the School of Law, where the Library fee is five dollars.

Beginning with the Summer term, 1910, students not legal residents of the State of Indiana will be charged a Contingent and Library fee amounting to twenty dollars a term. For each Summer half-term, half the fee will be charged. This fee is in lieu of the regular Library and Contingent fees noted above.

These fees cover in part the cost of the physical maintenance of the University, and are not applied to the cost of tuition, which is provided wholly by the State. The Laboratory fees in all courses are uniformly one dollar per credit hour, except in the courses of the School of Medicine, for which see separate announcement.

The Gymnasium fee, if the work in physical training is taken, is one dollar a term.

A Conditioned fee of five dollars a term is charged all students who have not, upon the records of the University, credit in full for all entrance work. This rule applies to both conditioned and special students with deficiencies in their entrance credit. It is provided, however, that if a student enters the University with an entrance condition of less than five hours, the fee will be refunded if the condition be removed in the first term of residence.

An Examination fee of one dollar is charged for each make-up or special examination. This fee is paid to the Bursar, and his receipt when presented to the proper instructor constitutes his authorization for holding the examination.

The fee for any Degree is five dollars, and must be paid to the Bursar at least thirty days before graduation, and a receipt for it filed with the Registrar.

The Library. The Library of Indiana University at present contains seventy-four thousand catalogued volumes. The selection of these books has been made by experts within the last twenty-five years with a view to facilitate instruction and research. The collection is a well-balanced one, and is especially strong in literary and scientific periodicals. The list of periodicals received and permanently kept on file by the library numbers about four hundred publications, including American, English, German, and French, and one each of Italian, Spanish, and Swedish. The library is made thoroughly usable by

a carefully-made card catalogue, by indexes, and other bibliographical aids. The Library force consists of a librarian and ten assistants, all of whom are at the service of any authorized user of the library.

In the library building are seminary rooms for the Departments of History, Economics, English, Philosophy, Romance Languages, German, Education, Latin, and Greek.

In addition to the central library, where the general, literary, and historical collections are housed, there are nine departmental collections, of varying sizes, kept in the different University buildings.

All books, with the exception of periodicals and books reserved for reference, may be drawn for home use, each student having the privilege of drawing three books for two weeks.

The Library is open Mondays to Fridays from 7:45 a.m. to 10:00 p.m., and Saturdays from 8:00 a.m. to 5:00 p.m.

DEGREES

Two advanced degrees, Master of Arts and Doctor of Philosophy, are conferred by the University.

Master of Arts. The degree of Master of Arts may be conferred upon Bachelors of Arts of this University, or of any other institution of equivalent standing, following a residence at the University of a minimum of three full terms and the completion of a minimum of forty-five hours of University Credit.

Less than a full term in residence will not be counted toward satisfying the residential requirements for the A.M. degree. There is no restriction in the amount of work that may be carried during any term.

Credits earned in excess of those required for the A.B. or B.S. degrees, before the degree is conferred or a certificate of the completion of the work for the degree is issued, are not counted toward the A.M. degree.

Thirty of the total of forty-five hours required for the degree A.M. must be in one Department, or in closely allied Departments. Fifteen hours must be distinctly graduate in character.

Graduates of this University may be given leave of absence for one term of the required year to pursue a specific investigation.

The work for the A.M. degree may all be done in Summer terms, with the reservation that the student must be in residence during three out of four successive Summer terms. Single half-terms will not be counted toward the residence requirement.

Professional studies are not accepted for the graduate degrees, but research work on professional subjects may be accepted at the option of the professor in charge of the major subject.

A thesis is required in all Departments except that of Latin.

Doctor of Philosophy. The degree of Doctor of Philosophy may be conferred upon graduates of this University, or of any institution of similar character and rank, upon the completion of an advanced course of study of not less than three years.

Each candidate for this degree will select a major subject consisting of the work of some one Department or recognized subdivision of a Department; and not less than two minors, at least one of which must be in some related but different Department from that of the major subject.

The course for the degree will be pursued under the direction of a committee consisting of the heads of the Departments in which the work is done. Its value will be determined by a final examination, and by the presentation of a satisfactory thesis, usually embodying original work upon some prescribed or accepted subject, and which must always give evidence that the candidate is capable of forming an independent judgment upon the recent literature of his Department.

A detailed statement of the work offered for the degree, indorsed by the professor in charge of the major subject, must be submitted to the Council of the Graduate School, not later than May 10 of the year in which the candidate presents himself for examination.

On the recommendation of the professor in charge of the major subject, and with the concurrence of the Couneil of the Graduate School, part of the three years' study required for this degree may be spent in residence at other universities.

The thesis of every candidate for the degree of Doctor of Philosophy shall be presented to the Council of the Graduate School on or before the first day of June of the year in which he proposes to take the degree. The thesis must be indorsed by the head of the Department as being in its final form, and ready for the press. If the candidate is recommended for the degree, arrangements must be made to deposit five printed copies of the thesis in the library.

Examinations of each candidate for this degree will be conducted by a committee consisting of all the instructors under whom graduate work has been taken, in the presence of such members of the Faculty of the School as care to attend.

At least one year before the final examination the candidate shall satisfy the professor in charge of the major subject of his ability to use French and German for purposes of investigation.

Application for Degrees. Application for the degree Master of Arts or Doctor of Philosophy must be filed with the Dean, at the time of admission to the Graduate School. Application for the degree Doctor of Philosophy must be on file at least one year before the candidate is admitted to the examination.

FELLOWSHIPS

Teaching Fellowships. A number of teaching fellowships are available for graduate students.

The Teaching Fellows are relieved from all term fees, and the fellowship carries with it an honorarium of between \$200 and \$500 annually. The highest amount will ordinarily be paid only if the incumbent is appointed for a third year. A Teaching Fellowship is primarily a recognition of scholarship. Not less than two-thirds of each Fellow's time must be devoted to work leading to the Doctorate in Philosophy; but he will be required also to give a portion of his time to the service of the Department in which he is appointed.

A Fellow may be appointed for three separate years, but not for more. Appointments are for one year, and do not necessarily imply a reappointment.

Donaldson Fellowship in Zoology. The Donaldson Fellowship in Zoölogy, with a value of \$500, is open to students who are in large measure capable of doing independent work in biological subjects. The fellowship implies residence for twelve months at the cave farm of the University, at Mitchell, Indiana. A certain amount of supervising work is required of the incumbent.

Lawrence Fellowship in Astronomy. The Lawrence Fellowship of the Department of Mechanics and Astronomy has been established by Mr. Percival Lowell, of the Lowell Observatory, upon the following terms and conditions:

- 1. The fellowship shall be known as the Lawrence Fellowship, in remembrance of the donor's mother, and is established in perpetuity, revocable, however, at any time at the will of the founder.
- 2. It shall be annually available and shall cover the college calendar year, that is, from commencement to commencement of the same.
- 3. The applicant shall be appointed by the Department, the donor reserving the right of final passing upon the suitability of the candidate so presented.
- 4. The Fellow shall be given time and opportunity for an original thesis on some astronomical subject looking to the taking of a Master's degree, the nature of which shall be decided by the Director and the Fellow. But the Fellow shall be expected to give general assistance in the observatory's work during the period of his fellowship.
- 5. The Fellowship will pay \$600 and the Fellow's traveling expenses to and from the Observatory at Flagstaff, Ariz.; and a furnished room at the Observatory shall be free to the Fellow's use.

Fellowships for Graduates of Other Indiana Colleges. The Trustees of Indiana University, at their March meeting, 1910, established ten Graduate Fellowships of an annual value of \$200 each, with exemption from term fees, to be held by graduates of other colleges in the State of Indiana. In awarding these fellowships, the policy will be to assign them to the most promising students, irre-

spective of the special field of study in which they wish to work, or the particular institutions from which they come. As between cases of equal merit, however, attention will be given to securing a distribution of the awards among different departments of study and different colleges of the State.

Applicants for these fellowships must fill out a formal application blank, and file it with the Dean of the Graduate School. This should contain a statement of the major subject which they wish to pursue, and be accompanied by a transcript of their college record, and such recommendations from their instructors and other evidences of fitness as they can offer.

The applications will be referred in each case to the Department of the major subject, which will decide upon the respective merits of the applicants in that Department. On the basis of the departmental reports, the Graduate Council will then recommend to the Trustees the most eligible candidates for appointment.

Holders of these fellowships will not ordinarily be eligible for reappointment, but will be eligible for appointment to teaching fellowships.

These fellowships are not open to students doing professional work in law or in medicine.

Applications are received this year up to May 10th. In subsequent years applications must be filed by March 15th.

For application blanks, and further information, address the Dean of the Graduate School.

Special Rule Concerning Fellows. Holders of fellowships are not permitted to accept remuneration for work done outside of the University, without special consent of the Graduate Council.

University Organizations

The Graduate Club. A graduate club was founded in 1910 to establish closer relations among the graduate students and with the members of the faculty. Through the association of its members at the meetings, and the close acquaintanceships there gained, the club aims to foster a community of spirit and a solidarity of interest. The meetings are in part social, and in part devoted to the presentation of papers by members of the club, giving the results of some investigation carried on by the author. In this way, students in the different Departments are made acquainted with the special advanced work in various lines of research carried on in the University. Occasionally addresses will be given by visitors of educational prominence. Membership in the club is open to all graduate students.

Sigma Xi. Sigma Xi is a somewhat similar organization, especially for scientific students. It is a chapter of a national scientific fraternity, to which members of the Faculty, graduate students, and Seniors may be elected. Its object is to encourage investigation in science, pure and applied.

Departmental Clubs. The following Departments have special departmental clubs: Geology, Zoölogy, Physics, History, Philosophy, English, Mathematics, German, French, and Philology. Membership in these clubs is open to Faculty members of the Department, graduate students, and undergraduates. The purpose of the clubs

is to discuss topics of interest to members, and to promote social intercourse.

The Indiana Union. The Indiana Union is a social organization of men, founded in 1909, with a charter membership of nearly 400. Membership is open to all men students, to Faculty members, alumni, and to ex-students. The Union is governed by a board of directors of ten persons (eight students, one alumnus, and one Faculty member), and the five officers. Officers and directors are elected each year. Business meetings of the Union are held four times during the college year.

The east wing of the Student Building is at present occupied by the Union. On the first floor is a lounging room, a trophy corner, and a billiard hall. A large room on the second floor is used as a reading room, where all leading magazines, city papers, and county papers from various parts of the State are available to all men of the University. Accommodations for writing will also be found in this room. Another of the rooms on the second floor is used by the officers and Board of Directors of the Union. The Union expects to make the rooms a place for students to spend their leisure time, in reading, getting acquainted with fellow students, and enjoying good, clean amusements.

The plans of the Union contemplate the construction of a building for the exclusive use of its members. Either a wing to the Student Building, or a separate building on the campus, will probably be erected in the course of the next few years. The funds are to be raised by subscriptions from alumni, students, and friends. A reading room, swimming pool, billiard room, lobby, trophy room, and rooms for meetings, are among the things planned to be included in the building.

The Women's League. This is an organization to which all women of the University are eligible, and which has for its purpose the furthering of social intercourse. Receptions, teas, and similar entertainments are given by it at frequent intervals in the Student Building to its members and their friends. The wives of members of the Faculty take an active part in this work.

Departments and Graduate Courses of Instruction, 1910–11

***In the following list are included many courses which are open alike to graduates and advanced underclassmen. Only a skeleton announcement of these is here made; for full description see the bulletin of the College of Liberal Arts, or under that heading in the University catalogue. Strictly graduate courses are here described in full. The more elementary courses are not listed here at all.

DEPARTMENT OF GREEK

HORACE A. HOFFMAN, Professor. Frank W. Tilden, Associate Professor.

The time that at the present may be profitably devoted to graduate work in Greek is one year, leading to the degree of A.M. A thesis on some subject connected with the seminary work of the year is required for the degree.

All candidates for A.M., with Greek as major subject, must take at least fifteen hours in Latin, in advance of the Latin taken in the undergraduate study.

Courses 9, 12, and 13, or any part of these courses, are also open as minors to graduate students who have not already had as part of their undergraduate study the work which they take in their courses for graduate credit.

The Department is well equipped for doing satisfactory work leading to the degree of Master of Arts. Besides the most important reference books, cyclopedias, dictionaries, lexicons, indexes, and standard editions of Greek writers, an effort has been made to build up an especially good collection of works treating of Euripides, since seminary work is generally given in that author. The Department has the chief older editions as well as

nearly all of the later ones, and many special works bearing on Euripides.

The Library contains the most important classical journals, among them complete sets of 'The American Journal of Philology'; 'The American Journal of Archaeology'; 'The Classical Review'; Chicago, Cornell, and Harvard 'Studies'; 'Hermes'; 'Jahrbücher für classische Philologie'; 'Mitteilungen d. deutsch. arch. Inst. in Athen'; 'Philologus'; 'Rheinisches Museum'; 'Journal of Hellenic Studies'.

Among the most valuable works in the field of Archaeology and Art the following may be named: 'Antike Denkmäler'; 'Ausgrabungen von Olympia'; 'Carapanos'; 'Dodona'; Hamdey-Bey and Reinach's 'Nécropole à Sidon'; Homolle's 'Fouilles de Delphes'; Ohnefalsch-Richter's 'Cypros, die Bibel und Homer'; Overbeck's 'Griechische Kunstmythologie'; Stackelberg's 'Die Gräber der Hellenen'; Fenger's 'Dorische Polychromie'; and the publications of the American and British Schools of Athens, and of the Egyptian Exploration Fund. Among the works on Inscriptions and Epigraphy the following may be mentioned: 'Corpus Inscriptionum Graecarum'; 'Corpus Inscriptionum Atticarum'; 'Inscr. Graec. Septentrionalis, Siciliae, Italiae, Pelopon., Insularum, etc., 'Die Inschriften von Priene', and the important writings of such authorities as Klein, Kretschmer, Meisterhans, etc. For palaeography and the study of the papyri are the following: Works by Grenfell, Hunt, Kenyon, Mahaffy, Mayser, Mitteis, Thompson and Wilkin. In the important field of vase-painting, the Library contains many valuable works. Among the most noteworthy are: Benndorf's 'Griechische und Sicilische Vasenbilder'; Collignon and Rayet's 'Histoire de la Céramique grecque': Dechelette's 'Les Vases ceramiques ornés de la Gaule romaine'; Furtwängler and Loeschke's 'Mykenische Vasen,' and 'Mykenische Thongefässe'; Furtwängler and Reichhold's 'Griechische Vasenmalerei'; Harrison and McColl's 'Types of Greek Vases,' and various books by Gardner, Huddilston, Klein, Kretschmer, Murray, Smith and Walters.

The Department also owns upwards of 700 photographs of landscapes, buildings, and works of art in Greece, Italy, and Sicily; and has many lantern-slides, busts, casts, a model of the Acropolis at Athens, and a series of reproductions of the famous Tanagra Figurines.

Following are the courses open to graduate students in the Department. The more elementary courses are not here listed; for these see the bulletin of the College of Liberal Arts, or under that heading in the University catalogue:

- 9. Lyric and Dramatic Poetry. Associate Professor Tilden. Fall, Winter, and Spring terms, daily, at 9:00.
- Philosophical Prose. Professor Hoffman. Fall, Winter, and Spring terms, T. Th., at 10:00.
- Historical and Rhetorical Prose. Associate Professor Tilden. Fall, Winter, and Spring terms, M. W. F., at 10:00.
- 15a. Graduate Seminary. Euripides is the author usually studied, but other authors may be selected. In 1909-10 Plutarch's 'Pericles' was made the basis of the work, and the portions of Thucydides and other authors bearing on the life and policies of Pericles were also studied. Professor Hoffman. Fall, Winter, and Spring terms, W., at hours to be appointed.
- 15b. Graduate Seminary: Aeschylus. In 1909-10 all the plays and fragments were studied, chiefly with a view to the religious and ethical ideas of Aeschylus. Associate Professor TILDEN. Fall, Winter, and Spring terms, F., at hours to be appointed.

DEPARTMENT OF LATIN

HAROLD W. JOHNSTON, Professor. LILLIAN GAY BERRY, Associate Professor.

The graduate courses of the Department are intended to meet the wants of those making the teaching of Latin in schools and colleges their profession, whether or not they are candidates for a degree. The work of the first year (Courses 34 or 33, 41, and 42) consists chiefly of lectures and recitations. After the first year the work is to a great extent individual (Course 50), including, besides wide reading in authors of all periods, the first-hand investigation of some subject selected with the approval of the Department.

In the Summer term courses are offered for both graduates and undergraduates. The work for the A.M. degree may be done in three summers. The undergraduate courses may be counted to satisfy the language requirement for graduation in other departments, or as elective work, but may not be counted for graduation in Latin without the permission of the Department obtained in advance.

If Course 33 is taken in the undergraduate course, Course 34 should be made a part of the graduate work, and *vice versa*.

Following are the courses open to graduate students in the Department. The more elementary courses are not here listed; for these see the bulletin of the College of Liberal Arts, or under that heading in the University catalogue.

33. Prose Writers of the Republic. Professor Johnston. Fall, Winter, and Spring terms, M. W. F., at 9:00. Courses 33 and 34 are given in alternate years.

- [34. Poets of the Republic. Professor Johnston. Fall, Winter, and Spring terms, M. W. F., at 9:00.] Omitted in 1910-11.
 - Topography and Monuments of Ancient Rome. Recitations, lectures, and assigned readings. Associate Professor Berry.

Fall, Winter, and Spring terms, once a week, at an hour to be arranged.

Platner, 'Ancient Rome.'

Open to graduate students only.

42. Readings in Latin Literature. The student will be guided and assisted in reading very considerable portions of those authors not included in other courses, with stress laid upon the subject matter rather than upon the language and style. Analysis and summaries will be prepared by the student and criticized by the instructor. Professor Johnston and Associate Professor Berry.

Fall, Winter, and Spring terms, once a week, at an hour to be arranged.

Open to graduate students only.

43. Advanced Composition. This course is intended especially for teachers, but may be taken by any persons who need practice in writing Latin. Professor Johnston and Mr. Preston.

Fall, Winter, and Spring terms, once a week, at an hour to be arranged.

Open to graduates and teachers of Latin.

50. Seminary. The critical study of the text of some standard author, with incidental investigation of problems in syntax, style, prosody, and so forth. In past years Caesar, Sallust, Tacitus, and Plautus have been made the subjects of similar work. In 1910-11 it is proposed to make a study of Terence. The student should be provided with the critical edition of Umpfenbach and the text editions of Dziatzko and Fleckeisen. Professor JOHNSTON.

Fall, Winter, and Spring terms, M., 2:00 to 3:50.

Open to students who have had one year's graduate work.

DEPARTMENT OF ROMANCE LANGUAGES

ALBERT F. KUERSTEINER, Professor of Romance Languages.

George D. Morris, Associate Professor of French.

CHARLES A. MOSEMILLER, Associate Professor of Romance Languages.

The Department of Romance Languages offers one year of graduate work, all in French.

The Library is well equipped with works in French criticism. It contains all of the volumes of the 'Grands Ecrivains de la France' series published thus far, and complete sets of 'Romania,' 'Zeitschrift für das Studium der Neueren Sprachen,' 'Zeitschrift für französische Sprache und Litteratur,' 'Französische Studien,' 'Revue des deux Mondes,' 'Revue de Cours et Conférences,' 'Biblioteca de Autores Españoles,' besides a fair selection of works in French and Spanish literature.

Following are the courses open to graduate students in the Department. The more elementary courses are not here listed; for those see the bulletin of the College of Liberal Arts, or under that heading in the University catalogue.

 Seventeenth Century Poetry and Drama. Professor Kuersteiner.

Fall, Winter, and Spring terms, M. W. F., at 9:00.

[24. Eighteenth Century Poetry and Drama, Professor Kuersteiner.

Fall, Winter, and Spring terms, T. Th., at 8:00.] Omitted in 1910-11.

[10. Nineteenth Century: The Romantic Period. Associate Professor Morris.

Fall, Wnter, and Spring terms, M. W. F., at 10:00.]
Omitted in 1910-11. Courses 10 and 27 are given in alternate years.

- Nineteenth Century: The Realistic Period. Associate Professor Morris.
 Fall, Winter, and Spring terms, M. W. F., at 10:00.
- 32. Contemporary Literature. Associate Professor Morris, Fall, Winter, and Spring terms, T. Th., at 10:00.
- Advanced Composition. Associate Professor Mosemiller. Fall, Winter, and Spring terms, T. Th., at 2:00.
- [28. Senior Composition. Associate Professor Mosemiller. Fall, Winter, and Spring terms, T. Th., at 3:00.] Omitted in 1910-11.
 - 13. Old French: Reading of texts; study of Old French phonology and morphology; exercises in tracing words from classical and from popular Latin to modern French; brief survey of Old French literature. Lectures. Professor Kuersteiner.

Fall, Winter, and Spring terms, M. W. F., at 11:00.

Paris, 'Extraits de la Chanson de Roland'; Suchier, 'Aucassin et Nicolete' (French edition); Constants, 'Chrestomathie de l'ancien français'; Paris, 'La littérature française au moyenage'.

Open to graduate students who have studied French and Latin.

[11. Seventeenth Century Prose. A critical study of selections from 'L'Astrée' of d'Urfé; from Scarron's 'Roman Comique'; from Furetière's 'Roman Bourgeois'; of Madame de la Fayette's 'La Princesse de Clèves'; of selected letters of Madame de Sévigné; of selections from Descartes's 'Discours de la Méthode'; from Pascal's 'Pensées'; from La Rochefoucauld's 'Maximes'; from La Bruyère's 'Les Caractères'; of Bossuet's funeral oration on Henriette d'Angleterre. Collateral reading and reports.

Fall, Winter, and Spring terms, T. Th., at 8:00.] Omitted in 1910-11.

[25. Eighteenth Century Prose. A critical study of selections from Fontenelle's 'La Pluralité des Mondes'; from Lesage's 'Gil Blas'; from Marivaux's 'La Vie de Marianne'; from Montesquieu's 'Lettres Persanes' and 'L'Esprit des Lois'; from Voltaire's 'Histoire de Charles XII', and 'Candide', and from his correspondence; of selections from Prévost, Buffon, Rousseau, Diderot, and Bernardin de St. Pierre. Lectures. Associate Professor Morris.

Fall, Winter, and Spring terms, M. W. F., at 8:00.] Omitted in 1910-11.

DEPARTMENT OF GERMAN

BERT J. Vos, Professor of German. CARL W. F. OSTHAUS, Professor. EUGENE LESER, Assistant Professor.

In combination with the Department of Comparative Philology, which gives courses in Gothic, Old High German, and Old Norse, the Department at present offers about thirty-five hours of Graduate work. Students entering upon the graduate study of German must previously have completed the courses required for a major in the Department, or their equivalent. Courses 27 and 29 are, however, open to students of other departments than German upon the completion of the work of the Junior year. The library is well equipped with books for the special study of Classical and Nineteenth Century German literature.

The list of complete sets of periodicals and of current publications received includes the following: 'Alemannia'; 'Allgemeine Zeitung' (München); 'Archiv für das Studium der neueren Sprachen und Literaturen': 'Arkiv für nordisk Filologi'; 'Beiträge zur Geschichte der deutschen Sprache und Literatur'; 'Bibliothek des litterarischen Vereins in Stuttgart'; 'Columbia University Germanic Studies': 'Das Litterarische Echo'; 'Euphorion'; 'Forschungen zur neueren Literaturgeschichte'; 'German-American Annals'; 'Goethe Jahrbuch'; 'Indo-

germanische Forschungen': 'Jahrbuch des freien deutschen Hochstifts'; 'Jahrbuch der Grillparzer Gesellschaft'; 'Jahrbuch des Vereins für niederdeutsche Sprachforschung'; 'Jahresbericht über die Erscheinungen auf dem Gebiete der Germanischen Philologie'; 'Jahresberichte für neuere deutsche Litteraturgeschichte'; 'Journal of English and Germanic Philology'; 'Korrespondenzblatt des Vereins für niederdeutsche Sprachforschung'; 'Literaturblatt für germanische und romanische Philologie'; 'Modern Language Notes'; 'Modern Language Review': 'Modern Philology': 'Monatshefte für deutsche Sprache und Pädagogik': 'Publications of the Modern Language Association of America'; 'Quellen und Forschungen'; 'Veröffentlichungen des Schwäbischen Schiller Vereins': 'Zeitschrift des Allgemeinen deutschen Sprachvereins': 'Zeitschrift des Vereins für Volkskunde'; 'Zeitschrift für Bücherfreunde'; 'Zeitschrift für deutsches Altertum'; 'Zeitschrift für den deutschen Unterricht': 'Zeitschrift für deutsche Mundarten'; 'Zeitschrift für deutsche Philologie': 'Zeitschrift für deutsche Wortforschung'; 'Zeitschrift für vergleichende Litteraturgeschichte'.

For Gothic and Old High German, see Courses 4 and 9 of the Department of Comparative Philology.

Following are the courses open to graduate students in the Department. The more elementary courses are not here listed; for these see the bulletin of the College of Liberal Arts, or under that heading in the University catalogue:

- German Usage. Assistant Professor Leser.
 Winter and Spring terms, T. Th., at an hour to be appointed.
- [21. Studies of the recent German Drama, Professor Osthaus.]
 Omitted in 1910-11.

28. Journal Club. This course is introductory to the work of the German Seminary. Members make reports upon the contents of current numbers of journals devoted to German literature and philology, and are trained in the use of important works of reference. Two to five hours' credit. Professor Vos.

Fall term, two hours weekly, at an hour to be appointed.

German Seminary: The Second Part of Goethe's 'Faust'.
 Conducted mainly in German. Two to five hours' credit.
 Professor Vos.

Winter and Spring terms, two hours weekly, at an hour to be appointed.

Open to students who have completed Course 28.

27. Middle High German. Outline of the phonology, accidence and syntax. Reading of selections from the lyric poets, the popular and court epic. Professor Vos.

Fall and Winter terms, two hours weekly, at an hour to be appointed.

29. History of the German Language. The relation of German to other Germanic languages; the dialectic divisions of Modern German; origins of the literary language; changes since the middle period; history of German orthography. Conducted partly in German. Professor Vos.

Spring term, two hours weekly, at an hour to be appointed.

Behaghel, 'Die deutsche Sprache' ('Das Wissen der Gegenwart', Band 54).

DEPARTMENT OF COMPARATIVE PHILOLOGY

Guido H. Stempel, Associate Professor.

The graduate courses offered below will be extended as required. They may be supplemented by certain of the courses listed as undergraduate, as well as by certain courses given in the other language Departments and in History, Social Science (anthropology), Philosophy, and English. The time that can profitably be spent here in graduate study in Philology is at present about two years.

The more elementary courses of the Department are not here listed; for these see the bulletin of the College of Liberal Arts, or under that heading in the University catalogue.

[5. Comparative Philology of the Classical Languages. An advanced course in the science of language and Indo-European philology. Each student will emphasize the particular language in which he has had special training. Associate Professor Stempel.

Fall, Winter, and Spring terms, M. W. F., at 10:00.

Giles, 'Manual of Comparative Philology for Classical Students'.

Open to students who have passed in Courses 2 and 3, and in thirty hours of language, and to advanced students in Latin or Greek.

Omitted in 1910-11.

[4. Gothic. Grammar and reading; phonology of the early Germanic languages. Associate Professor Stempel.

Fall, Winter, and Spring terms, T. Th., at 10:00.

Wright, 'Primer of the Gothic Language'.

Open to students who have passed in Course 2 and in thirty hours of language, and to others at the option of the instructor.

Given every third year; see Courses 9 and 10.] Omitted in 1910-11.

 Old High German. Elements of the grammar, reading of selected texts, study of dialectal divergence. The method will be both comparative and historical. Associate Professor Stempel.

Fall, Winter, and Spring terms, T. Th., at 10:00.

Wright, 'Old High German Primer'; Braune, 'Althochdeutsche Grammatik'; Braune, 'Althochdeutsches Lesebuch'.

Open to students on same conditions as Course 4.

Given every third year, following Course 4; see Courses 4 and 10.

[10. Middle High German. (1) Fall term: Elements of the grammar, reading of easy texts, and study of the development of the German language. (2) Winter and Spring terms: Nibelungenlied, with special study of the popular epic. Associate Professor Stempel.

Fall, Winter, and Spring terms, T. Th., at 10:00.

Wright, 'Middle High German Primer'; Paul, 'Mittelhochdeutsche Grammatik'; Robertson, 'Der arme Heinrich'; Zarncke, 'Das Nibelungenlied'.

Open to students on same conditions as Course 4.]

Omitted in 1910-11. Given every third year, following Course 9; see Courses 9 and 10.

[11. Old Norse. Introduction to the language, and the reading of texts that throw light upon the popular literature of England and Germany. Associate Professor STEMPEL.

Fall, Winter, and Spring terms, M. W. F., at 10:00.

Sweet, 'Icelandic Primer'; selected texts.

Open to students who have passed in fifteen hours of Germanic philology and to others at the option of the instructor.]

Omitted in 1910-11.

 Seminary. Some topic in grammatical theory or the development of some English usage will be made the basis of study. Associate Professor Stempel.

Fall, Winter, and Spring terms, W., 2:00 to 3:50.

DEPARTMENT OF ENGLISH

*WILL D. Howe, Professor of English.

CHARLES J. SEMBOWER, Professor of English.

HENRY T. STEPHENSON, Associate Professor of English.

FRANK AYDELOTTE, Associate Professor of English.

*Edward P. Morton, Assistant Professor of English.

RICHARD A. RICE, Acting Assistant Professor.

At present, two years may be spent with profit in pursuing the work which will lead toward the degree of Doctor of Philosophy. The Library is equipped for research work in several periods, is well provided with the principal periodicals, and with the publications of most of

^{*}Absent on leave, 1910-11.

the learned societies. The instructors of the Department will direct competent advanced students in lines of investigation and research.

Following are the courses open to graduate students in the Department. The more elementary courses are not here listed; for these see the bulletin of the College of Liberal Arts, or under that heading in the University catalogue.

- 33. Literary Criticism. Professor Sembower, and Associate Professor Aydelotte.
 - Fall, Winter, and Spring terms, two hours a week.
- 35. Composition Seminary. Professor Sembower, Associate Professors Stephenson and Aydelotte.
- [41. The Anglo-Saxon Period.]
 Omitted in 1910-11.
 - Chaucer. Associate Professor Aydelotte.
 Fall, Winter, and Spring terms, two hours a week.
- [43. The Elizabethan Age (1557-1625).] Omitted in 1910-11.
 - Elizabethan Drama. Associate Professor Stephenson. Fall, Winter, and Spring terms, daily, at 10:00.
- Shakspere. Associate Professor Aydelotte.
 Fall, Winter, and Spring terms, T. Th., at 10:00.
- The Age of Milton and the Age of Dryden (1625-1700). Professor Sembower.
 - Fall, Winter, and Spring terms, T. Th., at an hour to be appointed.
- The Eighteenth Century (1700-1770). Professor Howe. Fall term, daily, at 9:00.
- Topics of Romanticism (1770-1832). Assistant Professor Rice. Fall, Winter, and Spring terms, T. Th., at 11:00.
- [47. The Victorian Period (1832-1900).] Omitted in 1910-11.

A graduate student in English may not include in his list of courses in English more than one-third selected from the courses named above.

- [17. Metrics. A study of modern English meter.]
 Omitted in 1910-11.
- [50. Research Course in Anglo-Saxon Literature. An investigation of sources and authorities; reading of Anglo-Saxon literature. Prerequisite, Comparative Philology 2. Five hours of credit may be secured in this course each term.]

 Omitted in 1910-11.
- 151. Research Course in Middle English Literature. Reading of much prose, many romances, and some of the most important poems; study of sources and relationship. It is expected that students who take this course will be able to read Middle English, German, and French. Five hours of credit may be secured in this course each term.]

 Omitted in 1910-11.
- 52. Elizabethan Literature. Studies in the various forms of literature of the Elizabethan Age; investigation of sources and relationships. The work may deal either with individual authors or special literary forms. A reading knowledge of German and French is required. Five hours of credit may be secured in this course each term. Associate Professors Stephenson and Aypelotte.
- 53. Seventeenth Century Literature. A research course in the literature from 1625-1700. Reading knowledge of German and French is required. Five hours of credit may be secured in this course each term. Professor Sembower.
- 54. Eighteenth Century Literature. Studies in one of the fields of literature—the poetry, the drama, the essay, or the novel.

 Reading knowledge of German and French is required. Five hours of credit may be secured in this course each term.

 Professor Howe and Assistant Professor Rice.

55. Research Studies in the Literature of the Nineteenth Century.

Discussion of the various literary forms and study of the relationship between English and contemporary European literature. Reading knowledge of German and French is required. Five hours of credit may be secured in this course each term. Professors Howe and Sembower.

DEPARTMENT OF HISTORY AND POLITICAL SCIENCE

James A. Woodburn, Professor of American History and Politics. *Samuel B. Harding, Professor of European History.

Amos S. Hershey, Professor of Political Science and International Law.

ROYAL BRONSON WAY, Acting Professor of History. THOMAS L. HARRIS, Instructor.

The Department is prepared to offer research work leading to the A.M. and Ph.D. degrees, in the following fields: American Colonial History, the American Civil War and Reconstruction, English History in the Seventeenth and Nineteenth Centuries, the French Revolution, Diplomatic History, Political Philosophy, and International Law. In each of these fields good library collections are already at hand, to which constant additions are being made.

The following are among the periodicals and continuation sets at the disposal of advanced students of history and political science:

American Historical Association, Annual Reports, $1884\cdot$

American Historical Review, 1896-

American Journal of International Law, 1907-

American Magazine of Civics, 1894-6.

American Political Science Review, 1905-

Annales des Sciences Politiques, 1899-

^{*}Absent on leave, from August 1, 1910.

Annals of the American Academy of Political Science, 1890-

Annuaire Historique, 1819-50.

Annual Register, 1891-1828.

Archives Diplomatiques, 1905-

Camden Miscellany, 1847-

Camden Society Publications, 1838-

Columbia University Studies in History, Economics, and Public Law. 1891-

Cyclopedic Review of Current History, 1893-1902.

DeBow's Review, 1846-68.

English Historical Review, 1889-

Historical Manuscripts Commission Reports (Great Britain), 1870-

Gulf States Historical Magazine, 1902-04.

Hansard's Parliamentary Debates, 1812-1897.

Harvard Historical Studies, 1896-

Historische Zeitschrift, 1888-

Iowa Journal of History and Politics, 1903-

Johns Hopkins University Studies in History and Political Science, 1883-

Magazine of American History, 1880-93.

Niles' Weekly Register, 1811-49.

Political Science Quarterly, 1886-

La Revolution Française, 1899-

Revue de Droit International et de Legislation Comparée, 1896-

Revu Générale de Droit International Publique, 1894-

Revue Historique, 1895-

Revue Politique et Litteraire: Revue Bleue, 1880-

Royal Historical Society Transactions, 3d series, 1907-

South Atlantic Quarterly, 1903-

London Times (weekly ed.), 1896-7; 1901-

University of Missouri Studies, 1901-

University of Pennsylvania Publications: Series in Political Economy and Public Law, 1889-

University of Wisconsin Bulletin: Economics, Political Science, and History series, 1894-99.

Virginia Magazine of History and Biography, 1894-

William and Mary College Quarterly Historical Magazine, 1902-

Zeitschrift für Völkerrecht und Bundesstaatsrecht, 1906-

Candidates for the degree Ph.D., with History as major subject, will be examined on each of the following fields: (1) Ancient History, with emphasis at the option of the candidate in either Greek or Roman History; (2) Mediæval and Modern History, with emphasis in either the mediæval or the modern field; (3) English History, with emphasis either on the period before 1485, or after that date; and (4) American History, with chief emphasis either on the period before 1783, or after that date. The examination on the special field of the thesis will naturally be more searching than elsewhere.

Following are the courses open to graduate students in this Department. The more elementary courses are not here listed; for these see the bulletin of the College of Liberal Arts, or under that heading in the University catalogue:

- English History. Mr. Harris.
 Fall, Winter, and Spring terms, M. W. F., at 10:00.
- Renaissance and Reformation. Professor Way.
 Fall, Winter, and Spring terms, M. W. F., at 9:00.
- American Diplomatic History. Professor WAY.
 Fall, Winter, and Spring terms, T. Th., at 8:00.
- 23a. Government and Parties of England. Professor Hershey. Fall term, M. W. F., at 11:00.
- 23b. Government and Parties of Continental Europe. Professor Hershey.

Winter term, M. W. F., at 11:00.

- 24. History of Political Ideas and Theory of the State. Professor Hershey.
 - Spring term, M. W. F., at 11:00.
- [13. France in the Middle Ages. A study of the institutions of mediaval France, and of the processes whereby the feudal type of society was transformed into the modern state. Lec-

tures, collateral reading, and reports on assigned topics. Professor Harding.

Fall and Winter terms, T. Th., at 11:00.] Omitted in 1910-11.

[16. Historical Method. The principles of historical investigation, with some practice in the use of sources and the preparation of papers. Professor HARDING.

Spring term, T. Th., at 9:00.

Langlois and Seignobos, 'Introduction to the Study of History'.] Omitted in 1910-11.

28. American Political Discussions. A study of some of the more notable contributions to political and constitutional controversies in the national period of American history. Designed to introduce the student to a first-hand knowledge of the materials relating to the leading issues in our national development. Professor Woodburn.

Fall, Winter, and Spring terms, T. Th., at 9:00.

29. History of the West. A study of the westward movement in America, the advance of the frontier, western state-making, the character of western migration, trade movements and nationalizing influences. Professor Way.

Fall, Winter, and Spring terms, T. Th., at 10:00.

[20a. Seminary in English History. Individual research work, under the guidance of the instructor, on some subject connected with modern English history. The results of the investigations are presented from time to time as reports and are finally embodied in papers in form suitable for publication, of which a copy must be left with the Seminary. Professor Harding.

Fall, Winter, and Spring terms. Hours for individual conference to be arranged.]

Omitted in 1910-11.

20c. Seminary in American Constitutional and Political History. In 1909-10 the period of the Civil War was studied. Study of the sources, reports of investigations, and thesis work. Professor Woodburn.

Fall, Winter, and Spring terms, M., at 4:00 to 5:30. Open to advanced students and graduates.

20d. Seminary in International Law and Diplomacy. Research work and the special study of important topics, more especially of present day problems. During recent years such subjects were selected as the Alabama Claims, the Panama Affair, the causes of the Russo-Japanese War, the 'Open Door' policy in China, and the genesis of the Monroe Doctrine. Professor Hershey.

Fall, Winter, and Spring terms, at hours to be appointed.

DEPARTMENT OF ECONOMICS AND SOCIAL SCIENCE

ULYSSES G. WEATHERLY, Professor of Economics and Social Science. WILLIAM A. RAWLES, Professor of Political Economy. CLARENCE J. FOREMAN, Instructor.

The Department library is equipped with full sets of the most important public documents, both state and national, and has complete sets of most of the American, English, French, and German economic periodicals. Advanced students have direct access to these materials, and also to the special collections relating to charitable and correctional institutions. The Department is affiliated with the Charity Organization Society of Indianapolis, and through this means properly qualified students are enabled to come into direct contact with the social and economic problems of that city. Constant use is also made of the statistical materials in the various departments of the State government, and also in the State Library.

The more elementary courses of the Department are not here listed; for these see the bulletin of the College of Liberal Arts, or under that heading in the University catalogue.

The following courses are designed to furnish the work for the Master's degree. In certain cases a second year of graduate study may be taken with advantage.

- Money, Banking, and the Money Market. Professor RAWLES. Fall, Winter, and Spring terms, T. Th., at 8:00.
- Public Finance. Professor RAWLES.
 Fall, Winter, and Spring terms, M. W. F., at 8:00.
- 9. Transportation. Professor Rawles. Spring term, M. W. F., at 9:00.
- Advanced Political Economy. Mr. FOREMAN.
 Fall, Winter, and Spring terms, M. W. F., at 11:00.
- 20. Ethnology. Professor Weatherly. Fall term, T. Th., at 10:00.
- Comparative Sociology: The problem of the family. Professor Weatherly.
 Winter term, T. Th., at 10:00.
- Demography of the United States. Professor Weatherly. Spring term, T. Th., at 10:00.
- 4a. Social Pathology: Pauperism and charities. Professor Weatherly.

Fall term, M. W. F., at 10:00.

4b. Social Pathology, Crime and penology. Professor Weath-Erly.

Winter term, M. W. F., at 10:00.

- 4c. Social Pathology: Special problems. Professor Weatherly. Spring term, M. W. F., at 10:00.
- Socialism and Social Reform. Professor Weatherly. Fall term, T. Th., at 11:00.
 - 8. Seminary in Economics and Sociology. Professors Weatherly and Rawles, and Mr. Foreman,
 - Fall, Winter, and Spring terms, two hours a week, at an hour to be appointed.

Sa. Research. Special investigations upon economic or sociological subjects, directed toward the preparation of theses for the Master's degree. Hours and credit by individual arrangement. Professors Weatherly and Rawles, and Mr. Foreman.

DEPARTMENT OF PHILOSOPHY

ERNEST H. LINDLEY, Professor of Philosophy and Psychology.

WARNER FITE, Professor of Philosophy.

WILLIAM L. BRYAN, Lecturer on Ethics.

MELVIN E. HAGGERTY, Assistant Professor and Director of the Psychological Laboratory.

Following are the courses open to graduate students in the Department. The more elementary courses are not here listed; for these see the bulletin of the College of Liberal Arts, or under that heading in the University catalogue.

- 34. Psychological Seminary. Professor Lindley and Assistant Professor Haggerty.
 - Fall, Winter, and Spring terms, two hours a week.
- [35. Modern Idealism. Professor Fite. Fall, Winter, and Spring terms, T. Th., at 10:00.] Omitted in 1910-11.
- 36. Advanced Logic and Methods of Science. Professor Fite. Fall and Winter terms, two hours once a week at a period to be arranged.
 - Advanced Psychology. Professor LINDLEY or Professor FITE.
 Fall, Winter, and Spring terms, at hours to be arranged.
- [30. Seminary in Philosophy. A course designed to aid advanced students in the investigation of philosophical problems. The subject for 1909-10 was problems of contemporary philosophy. Professor Landley.

Fall, Winter, and Spring terms, two hours a week.] Omitted in 1910-11.

8. Psychological Research. Work arranged with individual students. Professor Lindley and Assistant Professor Haggerty.

Fall, Winter, and Spring terms, at hours to be arranged.

DEPARTMENT OF MATHEMATICS

SCHUYLER C. DAVISSON, Professor.
DAVID A. ROTHROCK, Professor.
ULYSSES S. HANNA, Associate Professor.
KENNETH P. WILLIAMS, Instructor.

The graduate courses at present offered in the Department require about three years for their completion.

The library of the Department, consisting of about 2,200 bound volumes, is located in Room 36, Wylie Hall. The library is open from 8:00 a.m. to 10:00 p.m., for use by students pursuing advanced work in mathematics. The collection of mathematical books consists of the more important English, French, and German texts, the collected works of Abel, Bernoulli, Cauchy, Cayley, Clifford, DeMorgan, Gauss, Jacobi, Lagrange, Lie, Möbius, Riemann, Schwartz, Smith, Steiner, and Weierstrass, together with the following sets of periodicals:

Acta Mathematica. Stockholm, Berlin, Paris. 1882 to date.

American Journal of Mathematics. Baltimore. 1878 to date.

American Mathematical Monthly. Springfield, Mo. 1884 to date.

Analyst (The). Des Moines, Ia. 1874-1883. Complete.

Annali di Matematica. Milan. Current numbers.

Annals of Mathematics. Charlottesville, Va., and Cambridge, Mass. 1884 to date.

Annales scientifiques de l'École Normale Supérieure. Paris. 1864 to date.

Archiv der Mathematik und Physik. Leipzig. 1841 to date.

Bibliotheca Mathematica. Leipzig. Current numbers.

Bulletin de la Société mathématique de France. Paris. 1872 to date.

Bulletin des Sciences mathématique. Paris. Current numbers.

Bulletin of the American Mathematical Society. New York. 1894 to date.

Bulletin of the New York Mathematical Society. New York. 1891-1894. Complete.

Cambridge Mathematical Journal. Cambridge, 1837-1845. Complete, Cambridge and Dublin Mathematical Journal. Cambridge, 1846-1854. Complete.

Educational Times (Mathematical Reprints from the). London. 1863 to date.

Giornale di Matematiche. Naples. 1862 to date.

Jahrbuch über die Fortschritte der Mathematik. Berlin, 1868 to date.

Jahresbericht der deutschen Mathematiker-Vereinigung. Leipzig. 1892 to date.

Journal de l'École Polytechnique. Paris. Current numbers.

Journal de Mathmématiques pures et appliquées (Liouville). Paris. 1836 to date.

Journal für die reine und angewandte Mathematik (Crelle), Berlin. 1826 to date.

L'Enseignement mathématique. Paris. Current numbers.

Mathematical Monthly (The). Cambridge, Mass. 1859-186E. Complete.

Mathematical Magazine. Washington. 1882-1884.

Mathematical Gazette. London. 1896 to date.

Mathematical Messenger (The). Ada, Louisiana. 1887-1894.

Mathematical Review. Worcester. 1896-1897. Complete.

Mathematical Visitor. Erie, Pa. 1877-1883. Complete.

Mathematische Annalen. Leipzig. 1869 to date.

Methesis. Ghent. 1881 to date.

Messenger of Mathematics (The Oxford, Cambridge and Dublin). Cambridge, 1862-1871. Complete.

Messenger of Mathematics (The). London and Cambridge. 1872 to date.

Monatshefte für Mathematik und Physik. Vienna. Current numbers. Nachrichten von der Königlichen Gesellschaft der Wissenschaften zu Göttingen. Göttingen. 1873 to date.

Nouvelles Annales de Mathématiques. Paris, Current numbers,

- Proceedings of the Edinburgh Mathematical Society. Edinburgh, 1883 to date.
- Proceedings of the London Mathematical Society. London. 1865 to date.
- Quarterly Journal of Mathematics, Pure and Applied. London. 1857 to date.
- Rendiconti del Circolo Matematico di Palermo. Palermo. 1884 to date.
- Revue de Mathématiques Spéciales. Paris. Current numbers,
- Revue Semestrielle des Publications mathématiques. Amsterdam. 1893 to date.
- Transactions of the American Mathematical Society. New York. 1900 to date.
- Zeitschrift für Mathematik und Physik. Leipzig. Current numbers. Zeitschrift für mathematischen und naturwissenschaftlichen Unterricht. Leipzig. Current numbers.

Following are the courses open to graduate students in the Department. The more elementary courses are not here listed; for these see the bulletin of the College of Liberal Arts, or under that heading in the University catalogue.

- 33. Fourier's Series and Fourier's Integrals. Four hours' credit. Professor Davisson.
 - Fall and Winter terms, T. Th., at a time to be appointed.
- Systems of Geometry. Six hours' credit. Professor ROTHROCK.
 Fall and Winter terms, at a time to be appointed.
- 20. Mathematical Reading and Research. Professors Davisson and Rothrock, and Associate Professor Hanna.
- [30. Theory of Surfaces. Lectures, assigned readings, and reports upon the general theory of surfaces and twisted curves; singularities of surfaces, asymptotic curves, lines of curvature, geodesic lines, and differential geometry are studied. Professor Davisson.]

Omitted in 1910-11.

21. Functions of a Complex Variable. The fundamental operations, conformal representation, stereographic projection and mapping upon the Riemann sphere, many-valued functions, Riemann surfaces. Lectures and reports. Six hours' credit. Professor ROTHROCK.

Summer term 1911, at a time to be appointed.

Prerequisite, Courses 10 and 13.

 Fundamental Concepts of Mathematics. A course dealing with the foundations of mathematics. Lectures and reports. Two hours' credit. Professor Davisson.

Spring term, T. Th., at an hour to be appointed.

- [23. Invariants and Covariants. A general study of algebraic forms with special reference to invariants, covariants and canonical forms. Four hours' credit. Associate Professor Hanna.]
 Omitted in 1910-11.
- 45. Calculus of Variations. Six hours' credit. Professor Roth-ROCK.

Spring and Summer terms (1911), at hours to be appointed.

[32. Theory of Numbers. Linear congruences, proofs of the law of quadratic reciprocity, the analytic and geometric theories of forms, etc. Three hours' credit. Associate Professor IIANNA.]

Omitted in 1910-11.

39. Theory of Groups and Substitutions. An elementary course dealing with the fundamental theorems preparatory to Course 40. Three hours' credit. Associate Professor Hanna.

Winter term, at hours to be appointed.

40. The Galois Theory of Functions. A continuation of Course 39; both courses based on Bianchi's 'Leziono sull Teoria dei Gruppi di Sostituzioni'. Three hours' credit. Associate Professor HANNA.

Spring term, at hours to be appointed.

 Bessel, Laplace and Lame Functions. Four hours' credit. Mr. WILLIAMS.

Fall and Winter terms at hours to be appointed.

47. Vector Analysis. A study of the algebraic, differential, and integral properties of vectors. Special emphasis will be laid on the physical interpretation and application of vectors. Three hours' credit. Mr. WILLIAMS.

Spring term, at hours to be appointed.

DEPARTMENT OF MECHANICS AND ASTRONOMY

WILBUR A. COGSHALL, Associate Professor of Astronomy. Vernon A. Suydam, Instructor in Mechanics.

DAVID A. DREW, Acting Instructor in Mechanics and Astronomy (1909-10).

Kirkwood Observatory, completed in 1900, is occupied by the Department. The building contains a library and computing room; a lecture room; dark room; a transit room, in which is a Bamberg universal instrument, a Howard sidereal clock, a mean time chronometer, and a chronograph; a dome twenty-six feet in diameter; and a room of the same size immediately below. In the dome is the refracting telescope, of which the 12-inch objective is by Brashear, and the mounting by Warner and Swasey, of Cleveland. The instrument has a focal length of about 15 feet, and is supplied with eyepieces magnifying from 130 to nearly 1,000 diameters; also with polarizing helioscope, diagonal eyepiece, and an electrically illuminated micrometer; there are both coarse and fine circles in right ascension and declination, the fine circles having reading microscope and electrical illumination.

The Department has in a separate building, a mounting, designed and built by the Department, that carries a 4-inch Browning refractor, a 5-inch portrait lens and an 8-inch parabolic mirror, for the photography of comets, nebulæ, etc.

Another building contains a collostat and horizontal telescope. The objective of the telescope has a diameter of 9 inches and a focal length of 64 feet. Both the plane of the collostat and the lens are by Petitdidier, of Chicago.

For an account of the Lawrence Fellowship in Astronomy, see page 17.

The Department receives telegraphic bulletins of discoveries made at American and European observatories.

Following are the courses open to graduate students in the Department. The more elementary courses are not here listed; for these see the bulletin of the College of Liberal Arts, or under that heading in the University catalogue.

- Orbits of Spectroscopic Binaries. Associate Professor Cogs-HALL.
 - Winter term, T. Th., at 2:00.
 - Theoretical Mechanics. Mr. Suydam.
 Fall, Winter, and Spring terms, M. W. F., at 9:00.
- Celestial Mechanics. An introductory course. Associate Professor Cogshall.
 - Spring term, M. W. F., at 11:00.
 - Open to students who have passed in Course 7.
- Theoretical Astronomy. Integration of equations of motion; computation of orbits and ephemerides. Associate Professor Cogshall.
 - Fall term. Hours and credit to be arranged with each student.
- 13. Astronomical Research. A limited number of students will be permitted to undertake research work under the supervision of the Department. The equipment is best suited for work in astronomy of precision and celestial photography. Associate Professor Cogshall.
 - Fall, Winter, and Spring terms. Hours and credit arranged with each student.

DEPARTMENT OF PHYSICS

ARTHUR L. FOLEY, Professor of Physics.
ROLLA R. RAMSEY, Associate Professor of Physics.

The Department offers a full course leading to the degree of Ph.D.

The supply of apparatus for the presentation of courses in modern experimental physics is fairly complete. The equipment and facilities for work have been largely increased during the past three years, especially in the way of delicate instruments and accurate standards for advanced study.

The Library of the Department of Physics contains about six hundred volumes, exclusive of sets of several journals. The following magazines are on file: 'Annalen der Physik', 'Annales de Chemie et de Physique', 'Beiblätter zu den Annalen der Physik', 'Physikalische Zeitschrift', 'The Electrical World and Engineer', 'The Electrician' (London), 'Journal de Physique', 'The Philosophical Magazine', 'The Physical Review', 'The Proceedings of the Physical Society of London', 'The Proceedings of the Royal Society', 'Le Radium', 'School Science and Mathematics', 'Science Abstracts' (A and B), 'Scientific American and Supplement', 'The Western Electrician', 'Cassier's Magazine', and 'The Manual Training Magazine'. Students have access also to the journals on file in the general library, and in the libraries of other Departments. Of these may be named: 'The American Journal of Science', 'The Astrophysical Journal', 'The Engineering and Mining Journal', 'The Engineering Magazine', 'Nature', 'Comptes Rendus', and 'Science'.

Following are the courses open to graduate students in

the Department. The more elementary courses are not here listed; for these see the bulletin of the College of Liberal Arts, or under that heading in the University catalogue.

- The Electromagnetic Theory of Light. Professor Foley. Fall, Winter, and Spring terms, T. Th., at 9:00. Wood, 'Optics'.
- 13. Advanced Mathematical Electricity. Associate Professor Ramsey.

Fall, Winter, and Spring terms, T. Th., at 8:00. Webster, 'Electricity and Magnetism'.

- 34. Sound. Mathematical and physical properties of the vibration of sound-producing bodies, such as strings, rods, plates, air columns, membranes, etc. Assistant Professor Dutcher. Fall, Winter, and Spring terms, T. Th., at 10:00.
- 16b. Laboratory Practice in Spectroscopy and Photometry. Associate Professor Ramsey.

Fall, Winter, and Spring terms, T. Th., at 2:00.

- 14. Advanced Laboratory Methods and Research. Professor Foley.
 - Fall, Winter, and Spring terms, daily, at 1:00.
- 22. Current Physical Literature. Professor Foley. Two hours a week throughout the year, at an hour to be appointed.
- 30. Advanced Theoretical Physics. A critical study of standard treatises and memoirs. Professor Foley.

Two hours per week, at a time to be appointed.

DEPARTMENT OF CHEMISTRY

ROBERT E. LYONS, Professor.
LOUIS S. DAVIS, Professor.
OLIVER W. BROWN, Associate Professor.
FRANK C. MATHERS, Assistant Professor.
CLARENCE E. MAY, Assistant Professor.

The Department of Chemistry has general, special, and private laboratories, a library room, a lecture room, balance rooms, an incubator room, a stock room, museum, etc. Special laboratories are provided for electrochemistry, assaying and electric furnace work, organic, inorganic and physiological chemistry, water and gas analysis, spectroscopic analysis. The laboratories comprise eleven large, well-lighted rooms, equipped with workstands, capable of accommodating two hundred and seventy-five students. Each room is provided with fume hoods and air registers connected with a ventilating fan for the removal of offensive and poisonous gases.

The general equipment for graduate work, including laboratory and library facilities, has been materially increased during the past year. A laboratory for electrometallurgy has been installed and fully equipped.

Special attention is given to inorganic, organic, physiological, physical and electro chemistry, technical analytical chemistry, and electro-metallurgy.

The graduate work of the Department, leading to the degree A.M. and Ph.D., comprises advanced laboratory, lecture, library and seminary work in the lines indicated above, and special graduate courses described below. A thesis embodying original investigation is required for an advanced degree.

The laboratories for advanced work and the departmental library are open from 8:00 a.m. to 5:00 p.m. There are no classes in the laboratories; each student works independently. A five-hour laboratory course requires two and one-half actual hours of laboratory work daily.

Following are the courses open to graduate students in this Department. The more elementary courses are not here listed; for these see the bulletin of the College of Liberal Arts, or under that heading in the University catalogue.

- Physical Chemistry. Laboratory work. Associate Professor Brown and Mr. Gamble.
- Electrochemistry. Associate Professor Brown and Mr. Gamble.
 Winter term. A. Lectures, T. Th., at 8:00. B. Laboratory,
 M. W. F., 1:00 to 4:50.
- Electrochemistry. Associate Professor Brown and Mr. Gam-Ble.
 - Spring term. A. Lectures, T. Th., at 8:00. B. Laboratory, M. W. F., 1:00 to 4:50.
- Storage Batteries. Lecures and laboratory work. Associate Professor Brown and Mr. Gamble.
 Fall term.
- Elementary Metallurgy and Assaying. Lectures and laboratory work. Associate Professor Brown and Mr. Gamble.
 - Fall term. Lectures, T. Th., at 8:00; laboratory work, F. S., 8:00 to 11:50.
- Advanced technical and engineering analysis. Laboratory work.
 Assistant Professor Mathers.

 Spring term, daily.
- 32. Gas and Fuel Analysis. Lectures and laboratory work. Assistant Professor Mathers.

 Winter term, three hours a week.

- Spectrum Analysis and Sugar Analysis. Lectures and laboratory work. Assistant Professor MATHERS.
 Fall term, two hours a week.
- Chemical Engineering. Associate Professor Brown. Fall term. Lectures, M. W. F., at 8:00.
- Seminary. Reports on current literature and special topics.
 (1) Fall term: Inorganic Chemistry. Assistant Professor Mathers.
 (2) Winter term: Organic Chemistry. Professor Lyons and Assistant Professor May.
 (3) Spring term: Electro- and Industrial Chemistry. Associate Professor Brown and Assistant Professor May.

Fall, Winter, and Spring terms, Th., at 7:00 p.m.

- 12a. Research in Organic or Physiological Chemistry. Professor LYONS and Assistant Professor MAY.
 Fall, Winter, and Spring terms, daily, 8:00 to 5:00.
- 12b. Research in the Chemistry of the Alkaloids. Professor Davis. Fall, Winter, and Spring terms, daily, 8:00 to 5:00.
- 12c. Research in Physical and Electrochemistry. Associate Professor Brown.

Fall, Winter, and Spring terms, daily, 8:00 to 5:00.

- 12d. Research in Inorganic Chemistry. Assistant Professor Mathers.
 - Fall, Winter, and Spring terms, daily, 8:00 to 5:00.
- 18c. Advanced Physical Chemistry. Lectures on selected chapters of Physical chemistry. Associate Professor Brown. Spring term, T. Th., at an hour to be arranged.
- 24. Advanced Electrochemistry and Electro-metallurgy. (A) Advanced laboratory work and research in pure and applied electrochemistry and electro-metallurgy, including investigations in electric furnace work, refining and extraction of metals, electro-synthesis of organic and inorganic compounds, manufacture of storage batteries, and of industrial electrochemical processes. (B) Lectures on the design and operation of commercial electric furnaces and on electric furnaces

processes and products. Associate Professor Brown and Mr. Gamble.

Fall, Winter, and Spring terms. Laboratory work, daily, 8:00 to 4:50; lectures, Winter term, F., at 8:00.

Students in this course are recommended to take Physics 10 and 24.

- 25. Advanced Organic Chemistry. A continuation of Course 6.
 (A) Lectures and recitations on selected chapters of organic chemistry. The topics considered in 1910 were: (a) The radical, (b) benzene nucleus, (c) stereoisomerism of carbon, (d) sugars, purins, proteins, terpenes and alkaloids.
 (B) Laboratory work or research in synthetic or analytical organic chemistry. Assistant Professor May.
 - (A) Winter and Spring terms, T. Th., 11:00. (B) Fall, Winter, and Spring terms, daily, 8:00 to 4:50.
 - Cohen, "Text Book of Organic Chemistry"; Roscoe and Schorlemer, "Treatise on Chemistry"; Hammersten, 'Physiological Chemistry"; Hensler-Pond, "Terpenes".

Presupposes Courses 61, 62, 7.

31. Advanced Inorganic Chemistry. Laboratory work. The preparation and study of the properties and reactions of the different compounds of the rare and uncommon elements, followed by research. This includes a review of the literature relating to the element that is being studied. Assistant Professor Mathers.

Fall, Winter, and Spring terms, M. W. F., 8:00 to 4:50.

DEPARTMENT OF GEOLOGY

EDGAR R. CUMINGS, Professor.

JOSHUA W. BEEDE, Associate Professor.

The work offered by the Department leading to the Ph.D. degree consists largely of research. Courses 10 and 13 are entirely of this nature. The problems offered for investigation are confined for the most part to stratigraphic geology and paleontology, although several

studies in economic and geographic geology have been successfully prosecuted by students in the past.

In stratigraphic geology the subjects covered by the researches of the Department have been concerned chiefly with the Ordovician and Mississippian rocks of Indiana, and with the Permian and Upper Carboniferous rocks of Kansas, Oklahoma and Texas. In pure paleontology the Department is especially equipped for the study of problems in the development of Paleozoic Brachiopoda and Bryozoa, and considerable work has already been published in this field.

For the prosecution of researches along the lines indicated above, the Department is adequately equipped. The collections of fossils are especially rich in material from the Ordovician, Silurian and Mississippian of Indiana, and the Upper Carboniferous and Permian of Kansas. The latter collections are among the best in America. A special feature of the collections is the wealth of screenings containing immature stages of Brachiopoda, Bryozoa, etc.

The laboratory equipment contains the usual apparatus for the preparation of material, and machinery for cutting, grinding, and polishing thin sections of fossils. An enlarging camera, with special lighting appliances and combinations of lenses for a wide range of work, is available as an aid in the proper illustration of paleontological material.

The Department receives the following periodicals: 'Geological Magazine', 'Quarterly Journal of the Geological Society of London', 'Zeitschrift der deutschen geologischen Gesellschaft', 'Neues Jahrbuch für Geologie, Mineralogie und Paläontologie', 'Geologisches Central-

blatt', 'Geographische Zeitschrift', 'Bulletin de la Société Géologique de France', 'Annales de Géographie', 'Annales de Paléontologie', 'Bulletin of the American Geographical Society', 'Scottish Geographical Magazine', 'Journal of Geography', 'Journal of Geology', 'Economic Geology', 'Bulletin of the Geological Society of America', 'Bulletin of the Scientific Laboratories of Dennison University', 'Bulletin of the Geological Department of the University of California', 'School of Mines Quarterly', 'Engineering and Mining Journal', 'Transactions of the St. Louis Academy of Science', 'Journal of the Cincinnati Society of Natural History', 'Monthly Weather Review'.

Following are the courses open to graduate students in the Department. The more elementary courses are not here listed; for these see the bulletin of the College of Liberal Arts, or under that heading in the University catalogue.

- 3. Economic Geology. Associate Professor Beede. Winter term, daily, at 10:00.
- Systematic Paleontology. Professor Cumings and Associate Professor Beede.
 - Fall, Winter, and Spring terms, two to five hours at times to be arranged.
- Research. Investigations of geological and paleontological problems. A careful report on each investigation is required, in proper form for publication. Professor Cumings and Associate Professor Beede.
 - Fall, Winter, and Spring terms, daily, 9:00 to 4:50.
- 13. Advanced field work. Continuous work in the field for a month or more in the Summer, Fall, or Spring. The course will usually form part of the research work submitted for an advanced degree. The work must be largely independent, but will always be under the general oversight of a member of the Department.

[5a. Evolution. Study of the principles of evolution, as illustrated by fossil organisms. Professor Cumings.

Winter term, at an hour to be arranged.]
Omitted in 1910-11.

14. Stratigraphic Geology. A thorough study of the literature of the various geologic systems. The history of their investigation and the present knowledge of their divisions, distribution, faunas and paleogeography will be exhaustively considered. Professor CUMINGS.

Fall, Winter, and Spring terms. Lectures, T. Th., at 10:00.

DEPARTMENT OF BOTANY

DAVID M. MOTTIER, Professor. Frank M. Andrews, Associate Professor. James M. Van Hook, Assistant Professor.

Graduate work leading to the degree of Master of Arts in Botany comprises special studies along some line indicated in the advanced courses enumerated below, or the investigation of some problem of a more limited scope. For the degree of Doctor of Philosophy, the subject of the thesis is selected from some line of morphology, cytology, physiology, or mycology. A reading knowledge of German and French is assumed.

The departmental library contains the more necessary works of reference and the principal botanical journals.

Following are the courses open to graduate students in the Department. The more elementary courses are not here listed; for these see the bulletin of the College of Liberal Arts, or under that heading in the University catalogue.

- Morphology of Fungi. Assistant Professor VAN Hook. Fall, Winter, and Spring terms, daily, 1:00 to 3:00.
- Physiology. Associate Professor Andrews. Winter and Spring terms, daily.

- 6. Cytology. Professor MOTTIER, Fall, Winter, and Spring terms, daily.
- 5a. Advanced Physiology. Special studies will be offered to those pursuing work for advanced degrees. Associate Professor Andrews.

Fall, Winter, and Spring terms, daily.

Original Research. Problems for special investigation in morphology and cytology will be assigned to students who are prepared to undertake original work. Professor MOTTIER.

Fall, Winter, and Spring terms, daily.

Ability to read German and French is assumed.

13. Morphology of the Algae. A study of the life-history and of the development of vegetative and reproductive organs in certain algae. The work is confined very largely to freshwater forms. Professor MOTTIER.

Fall, Winter, and Spring terms, daily.

 Investigations in Mycology and Plant Pathology. Assistant Professor Van Hook.

Fall, Winter, and Spring terms, daily, 1:00 to 3:00.

DEPARTMENT OF ZOÖLOGY

Carl II. Eigenmann, Professor and Director of the Biological Station. Fernandus Payne, Assistant Professor.

Full work leading to the degree Ph.D. is offered in Course 6. It is purely a research course, and offers the widest choice of subjects permitted by the equipment of the Department.

The subjects selected have radiated from two centers. One of these is the problem or problems of the freshwater fauna of tropical America. At present the Department is engaged in a study of divergent evolution as shown by the tropical American Characin fishes, and on a monograph on the fishes of British Guiana.

The Department is well equipped for this work. The most important of the zoological collections is the collection of fishes, comprising many thousand specimens. Arrangements have been made for coöperation with various other institutions, by which the largest aggregation of collections of South America freshwater fishes in the world is available for the monographs in preparation. By special arrangement the collections of Harvard University, made by L. Agassiz and his assistants during the Thayer expedition, and by others, are available for a monograph on the American Characins.

The Department has entered into vital relations with the Carnegie Museum of Pittsburg. Under the direction of Dr. W. J. Holland, director of this Museum, Mr. John Haseman, A.M.'07, during 1907-1910, explored the coastal rivers of Brazil, Uruguay, and Argentina, between the Rio San Francisco and Buenos Aires. He ascended the Rio Paraguay, crossed to the Guaporé and descended that river and the Rio Madeira to Manaos, on the Amazon, making collections on the way.

From August to December, 1908, Professor Eigenmann, with Mr. S. E. Shideler as volunteer assistant, explored the Demarara, Essequibo, and Potaro rivers of British Guiana. Very extensive collections were made in the low-land, as well as above the Kaieteur, a vertical fall of 741 feet of the Potaro river. The results of the expedition are being published by the Carnegie Museum as reports of the British Guiana Expedition of Indiana University and the Carnegie Museum.

The second center of departmental interest has been and is the subject of heredity, especially: (A) The history of the Sex Cells, (B) Variation, (C) the rate of ontogenic and phylogenic modification of the sense organs of Cave Animals, (D) Regeneration.

For the study of cave animals (C) the facilities of the Department are ideal. The University is located at the edge of the great cave region. By act of the Legislature, the Donaldson estate near Mitchell, Indiana, has been placed in the keeping of the trustees of Indiana University. On it are situated numerous sink-holes, dry caves, and an underground water-course at least two miles long. This underground river is rich in blind fishes and other blind aquatic animals. A small laboratory and dwelling has been erected on the farm, and is in charge of a research fellow, appointed from year to year. In the study of cave animals the Department has in the past had the cooperation of the Carnegie Institution, the American Association for the Advancement of Science, and the Elizabeth Thompson Science Fund.

For the study of variation (B) in non-migratory vertebrates in a 'unit of environment' this Department organized and has since maintained a fresh-water Biological Station. It is at present located on Winona Lake, Kosciusko County, Indiana, in the grounds of the Winona Assembly. The Station owns, as a gift of the Winona Assembly, two buildings, 20×45 feet, each two stories high. The buildings are on the lake front, at the mouth of Cherry Creek. The Station also owns boats, nets, sounding and temperature apparatus, glassware, etc. Microscopes and other needed apparatus are moved to the Station from the University.

For the study of sex cells (A), under the direction of Dr. Payne, the Department owns all the necessary apparatus, and the surroundings of the University offer an abundance of material,

Following are the courses open to graduate students in the Department. The more elementary courses are not here listed; for these see the bulletin of the College of Liberal Arts, or under that heading in the University catalogue.

3. Advanced Zoology. Professor Eigenmann and Assistant Professor Payne.

Fall, Winter, and Spring terms, five hours a week.

 General Biological Problems: (A) The development of the idea of evolution and Darwinism; (B) The laws of heredity. Professor Eigenmann.

Spring term, daily, 9:00.

 Seminary. Weekly meetings of advanced students and instructors to discuss current literature and report on investigations in progress. Professor Eigenmann and Assistant Professor Payne.

Fall, Winter, and Spring terms, M., at 4:00.

6. Research. Special investigation of zoological problems, with a report on each investigation. Branches in which subjects have in the past been selected and reported upon are Variation, Degeneration, Regeneration, Sense Organs, Embryology of Fishes, Faunal and Systematic Studies of Fishes, Ecology of Cave and Freshwater Animals. For a fuller statement, see the general statement of the Department. Professor Eigenmann and Assistant Professor Payne.

Fall, Winter, and Spring terms, daily, 8:00 to 4:50.

7. Biological Survey. A continuation of the previous work in the physical and biological features of Winona Lake and its environs. Professor Eigenmann.

Summer term, at the Biological Station.

DEPARTMENT OF ANATOMY

Burton D. Myers, Professor.
Augustus G. Pohlman, Professor.

Following are the courses open to graduate students in the Department. The more elementary courses are not here listed; for these see the bulletin of the College of Liberal Arts, or under that heading in the University catalogue.

13. Research Work. Opportunity for research work is offered to advanced students who may have at least one-half their time for one year free for the work. Professors Myers and POHLMAN.

Fall, Winter, and Spring terms, at hours to be appointed.

15. Advanced Course in Anatomy. Open to students who have completed the dissection of the human body, and desire to do special or advanced work. Professors Myers and Pohlman. Fall, Winter, and Spring terms, at hours to be appointed.

PHYSIOLOGY AND PHARMACOLOGY

WILLIAM J. MOENKHAUS, Professor.
DENNIS E. JACKSON, Assistant Professor.

Facilities for research leading to the higher degrees are available within restricted lines in general Physiology.

Following are the courses open to graduate students in the Department. The more elementary courses are not here listed; for these see the bulletin of the College of Liberal Arts, or under that heading in the University catalogue.

- G. Advanced Physiology. Professor Moenkhaus. Fall, Winter, and Spring terms, at hours to be arranged.
- Pharmacology. Assistant Professor Jackson. Spring term, M. W. F., 1:00 to 4:50.

10. Research. Problem work in certain phases of general physiology may be taken by those properly equipped. Professor Moenkhaus, and Assistant Professor Jackson.

Fall, Winter, and Spring terms, daily, 8:00 to 4:50.

DEPARTMENT OF PATHOLOGY

HENRY R. ALBURGER, Professor.

The following course is open to graduate students in the Department. The more elementary courses are not here listed; for these see the bulletin of the College of Liberal Arts, or under that heading in the University catalogue.

 Advanced Work and Research. Advanced diagnostic work or research work under the direction of the head of the Department. The facilities permit work along any of the lines of pathological or bacteriological research. Professor AL-BURGER.

Fall, Winter, and Spring terms, daily, 8:00 to 4:50.

School of Education

WILLIAM LOWE BRYAN, President of the University, Acting Dean.
ERNEST O. HOLLAND, Professor of Secondary Education.
WILLIAM W. BLACK, Professor of Elementary Education.
ELMER E. JONES, Professor of the History and Philosophy of Educa-

George F. Arps, Associate Professor of Educational Psychology.
Henry Lester Smith, School Administration.

tion.

Graduate work is offered in the School of Education, and special programs leading to the M.A. and Ph.D. degrees, with the Master's and Doctor's Certificates of Education, will be arranged on application.

In the future, as in the past, the best work of students in the courses in research work and in the pedagogical seminary will be published under the title 'Contributions from the Pedagogical Seminary of Indiana University.'

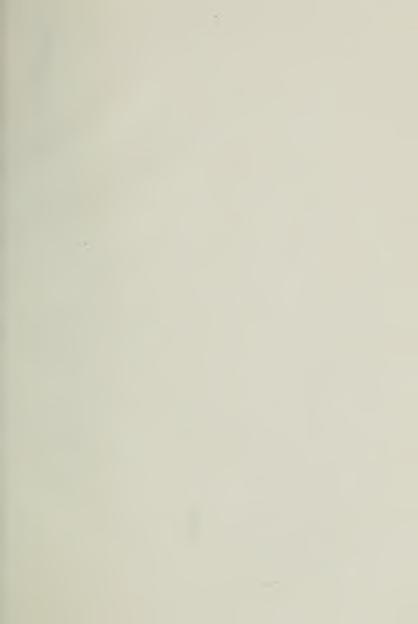
Following are the courses open to graduate students in the School. The more elementary courses are not here listed; for these or for fuller statements of the courses below, see the bulletin of the School of Education.

- Secondary Education in Germany, France, and England. Professor Holland.
 - Fall, Winter, and Spring terms, at 11:00.
- History of Education. Professor Jones.
 Fall, Winter, and Spring terms, T. Th., at 8:00.
- 13a. The Teaching of French. Professor KUERSTEINER. Spring term, T. Th., at an hour to be appointed.
- 13b. The Teaching of German. Professor Vos. Spring term, T. Th., at an hour to be appointed.

- 13c. The Teaching of Grammar in the High School. Associate Professor Stempel.
 Spring term, T., at 4:00.
- 13d. The Teaching of English in the High School. Mr. PITTENGER. Fall term, W., at 2:00. Repeated in the Spring term.
- 13c. The Teaching of History in the High School. Mr. Williams. Spring term, T., 4:00 to 5:30.
- 13f. The Teaching of High School Mathematics. Professor Davisson.
 Soring term, M. W., at 4:00.
- 13g. The Teaching of High School Physics. Professor Foley. Spring term, at an hour to be appointed.
- Philosophy of Education, Professor Jones,
 Fall, Winter, and Spring terms, M. W. F., at 8:00.
- School Administration. Superintendent SMITH.
 Fall, Winter, and Spring terms, M. W., at 7:00 p.m.
- 16a. Educational Seminary. Professor Jones.
 Fall, Winter, and Spring terms, T., at 7:00.
- 16b. Seminary in Social Education. Professor Holland.
 Fall term, two hours a week. Repeated in the Spring term.
- Advanced Educational Psychology. Associate Professor Arps. Fall, Winter, and Spring terms, T. Th., at 9:00.
- 9. Orthogenics. Professor Jones. Fall, Winter, and Spring terms, T. Th., at 3:00.
- 11. Principles of Organization and Supervision. Development of the law and principles that control in the organization and conduct of the school. The law evolving the school. The curriculum under its logical and psychological aspects; the basis for making a course of study; comparison of typical courses. Universal method in teaching. The organization of a subject. The organic relation of the logical, esthetic, and ethical ends in education. Professor Black.

Fall, Winter, and Spring terms, T. Th., at 2:00. Open to Graduate students, and to teachers of wide experience,

- 18. Research in Education.
 - a. The problems of the Elementary School. Professor Black.
 - b. The History and Philosophy of Education. Professor ${\bf Jones.}$
 - c. The Psychology of the Processes of Education. Associate Professor Arps.
 - d. Secondary Education. Professor Holland. Problems and hours to be arranged with professors in charge.



Indiana University comprises the following schools:

The College of Liberal Arts, The School of Education, The Graduate School, The School of Law, The School of Medicine.

The following publications are issued annually by the University:

The University Catalogue,
The Spring Term Bulletin,
The Summer Term Bulletin,
Bulletin of the College of Liberal Arts,
Bulletin of the School of Education,
Bulletin of the Graduate School,
Bulletin of the School of Law,
Bulletin of the School of Medicine.

Any of these publications will be sent upon application to

THE REGISTRAR, INDIANA UNIVERSITY,
Bloomington, Indiana.



